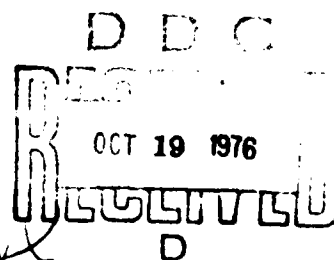
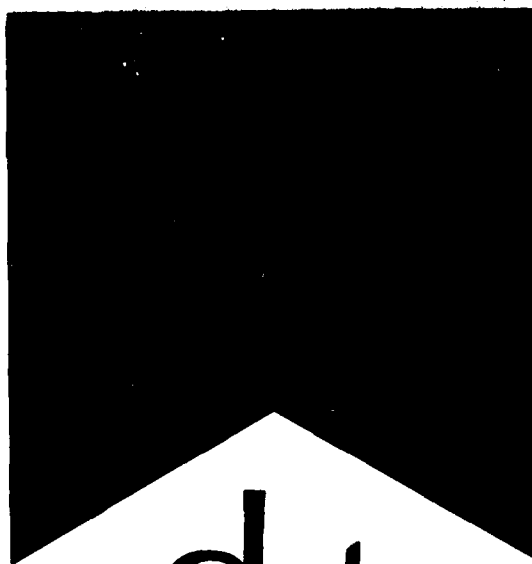


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FINAL REPORT

August 1976

NAVAL OFFICER RETENTION IN AN ALL VOLUNTEER FORCE ENVIRONMENT: JOB PROFICIENCY AND ORGANIZATIONAL CLIMATE

by

Will E. Lassiter
and
John H. Proctor, Ph.D.

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Measures of perceived unit organizational climate and ratings of job proficiency on a selected sample of young Naval officers ending their period of obligated military service in each of three successive years were collected during the three year period. The cumulative total of 3,628 officers in the sample was studied to: (a) determine if there were significant differences in organizational climate perceptions and job performance between officers who stayed in the Navy (stayers) and those who left (leavers); (b) develop prediction models to discriminate between stayers and leavers; and, (c) test the prediction capability of the models on the same groups a year later and test the models on a new group a year after model development. Discriminant Function Analysis models applied to data from the two Minimum Service Requirement (MSR) groups improved over chance in predicting stayers by 25 percentage points for the MSR 73 model and 35 percentage points for the MSR 74 model. The models' performance when applied to data collected from the same groups a year later showed deterioration in stayer prediction in the first case by 6.0 percent and in the second case by 22.6 percent. Overall the total correct prediction of stayers dropped by 4.3 percent for the MSR 73 model and by 10.7 percent for the MSR 74 model. The performance of the models developed on one MSR group suffered substantial deterioration when applied to other MSR groups. This may suggest that the MSR group, as a data division for testing, is too gross for the development and refinement of a predictor model for officer retention.

Continued-

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2. Attitudes						
3. Job Opportunity						
4. Job Satisfaction						
5. Navy Warfare Communities						
6. Officer Designators						
7. Officer Fitness Report						
8. Officer Performance						
9. Officer Proficiency						
10. Officer Sources						
11. Organizational Climate						
12. Organizational Research						
13. Pay						
14. Perceptions						
15. Personnel Decisions						
16. Retention						
17. Zero Draft						

Minimum Service Requirement

CONTINUED (2-1-73H)

conclude, The study results demonstrate that there is a difference between stayers and leavers in perception of unit organizational climate and in job performance and that these differences may be predictive of staying or leaving, that predictive models developed on (MSR) group deteriorate in performance when applied to data from the same group in a succeeding year, or when applied to different MSR groups; that it is impossible to conclude on the basis of a one year comparison, the extent and degree of model performance; that the longitudinal tracking of young Naval officers is feasible and within the existing reporting capability of BuPers. The exercise of this technique could prove of value in determining what track or career patterns, when correlated with perceptions of unit organizational climate and individual performance, provide the greatest return on investment in young Naval officer retention.

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The authors wish to thank the many individuals who cooperated and contributed to this study. Specifically, we wish to acknowledge the contributions of William B. Soyars III, who supervised and participated in the collection of the Fiscal Year 1974 and 1975 study data and Dr. Charles R. Mann, Ph.D., who helped develop and supervised the statistical analysis of the data. Our thanks also go to Toke Jayachandran, Ph.D., our Contract Technical Advisor in the Office of Naval Research and to the officials in the Bureau of Naval Personnel who contributed to the collection and advised on the application of the data.



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EXECUTIVE SUMMARY

Prediction of personnel turnover has been studied for a variety of employee classifications and predictor variables including intelligence and aptitude test scores, interest patterns, personality traits, biographical data and job satisfaction (Schuh, 1967).

Turnover--the identification and counting of leavers and stayers after a specific period of time--is the criterion of most of the reported studies. Generally, the findings tend to document why leavers leave and what characteristics of people could be used in screening procedures to reduce turnover.

This study attacks the turnover/retention problem by looking primarily at the stayer rather than the leaver in hopes of finding factors influencing career decisions over which management has some control. In addition to, or in spite of, personal factors such as spouse's opinion and the influence of earlier life, acts of God and the state of the job market, are management policy and practice as perceived at the unit level predictive of staying or leaving? Based upon practical experience and research findings concerning the effect of intrinsic factors on overall job satisfaction (Dunnette, Campbell and Hakel, 1967), we thought the answer would be yes for a group of junior managers.

Our hypothesis is that organizational climate at the unit level exerts a major influence on the making of a career decision. Thus, the measurement of individual perceptions of unit organizational climate may well be predictive of whether the individual will elect to remain in place or to change jobs when presented with the option.

However, individuals who are not performing well, and are told so by their bosses, may prefer to leave if provided the opportunity to do so no matter how favorably they perceive their unit's organizational climate prior to their career decision. Most formal organizations are constantly developing information concerning their junior managers in order to be able to make judgments as to those they wish to retain and those they do not wish to retain, based on a host of organizational considerations. In other words, the intent is on a successive culling of what is believed to be the most capable managers based upon past and current individual performance.

We shall conclude that those who elect to stay in their organizations do indeed see them in a better light than those who do not choose to stay. This conclusion will lead us to the proposition that these individuals, when they reach a career decision point, who like their organization and whom the organization believes are performing well have a greater probability of making the early career decision to remain with the organization than those who perceive their unit organizational climate less favorably and whose performance the organization has judged comparatively lower.

Our exploratory study looks at the job performance of young Naval officers together with their perception of their unit organizational climate, and then examines whether measures of these factors are predictive of staying in the Navy. One might ask why we do not simply query these officers as to whether they plan to stay or leave. It has been our experience that young managers in large, formal, hierarchically structured organizations can be expected to answer that question: "Of course I plan to stay" in order to protect his or her options.

As for exit interviews, they are after the fact and also, of course, touch only reasons for leaving which may or may not be candid. One final preliminary observation: a practical question can be asked as to what can be done with statistics on stayers and leavers obtained in the fashion we propose. We suggest that in addition to overall organization manpower planning and policy formulation, organization development techniques might be applied at the unit level to maintain areas of strength and improve or eliminate problem areas thereby increasing the odds of decisions to stay by managers who are performing comparatively well.

A. FINDINGS

Details of all findings of the study can be found in major findings of each prior technical report. The major findings of all phases of the study are stated below.

- The results of the first phase of this study validated the research design and documented a statistically significant difference between stayers and leavers in terms of their job performance and perceptions of unit organizational climate.
- During the entire course of this study, the feasibility of tracking the young naval officer has been demonstrated. The determination of the effect of various career tracks or patterns on personnel retention is a technique presently used in large companies in the private sector. This kind of focus on retention at the individual level as opposed to the macro level is consistent with the current emphasis on Navy manpower planning with such systems as NAMPS.
- Models were developed on two separate MSR Groups which improved over chance, by 25 percent and 35 percent respectively, the prediction of a stayer at that individual's MSRI.

- This final phase of the investigation of young officer retention indicated an expected deterioration in the models' performance as initially predicted stayers subsequently became leavers.
- With study termination after the second year of testing, there are only two data points. An authoritative assessment of the models' potential cannot be made on this limited comparison. At this point, our findings can only state that the results do not disagree with the study hypothesis.

B. CONCLUSIONS

- After looking at test results of the data collected, there is evidence to indicate that not only are the populations of young officers from three source groups in three warfare specialties different between MSR groups but also differences exist between subgroups. There appears to be a need to develop separate models for each subgroup within source and warfare specialty as well as different models for the FY quarters between MSRI and MSR + 2 years. Additionally, the evidence suggests the possibility of some nonlinear relationships between some of the subgroups and the predictor variables. Further investigation of this relationship appears warranted.
- It is reasonable to expect management at the unit level to be able to improve retention; however, there are practical limits to such efforts. To be cost effective, they must be part of an orchestrated effort involving all organizational levels through time. One would expect that organization policy concerning entry requirements, job change, promotion and training opportunities and competitive benefits will be supportive of unit retention improvement efforts and that management practice of various levels of the organization and across units is consistent in terms of emphasis and resource allocation to organizational climate improvement.

- The prediction of stayers based upon factors over which an organization has control is possible. The type of prediction used in this study, and the longitudinal tracking of the "retained individual," suggest that it is possible for management to calculate cost avoidance as a function of retention. Organizations can measure on a cost basis the retention success of every organizational unit. Periodic review of these data as an "early warning device" can be the basis for improvement actions at all organization levels coupled with policy planning as the organization's growth profile changes through time.
- The results of this study must certainly be due in part to the Navy's existing Human Resources Management Program and perhaps would be different in other times and for other organizations.

FOOTNOTES

1. A. J. Schuh. The Predictability of Employee Tenure: A Review of the Literature. Personnel Psychology. 1967. Vol. 20.
2. M. D. Dunnette, J. P. Campbell and M. D. Hakel. Factors Contributing To Job Satisfaction and Job Dissatisfaction In Six Occupational Groups. Organizational Behavior and Human Performance. 1967.

I. INTRODUCTION

For the past three decades young men of the United States were faced with a prospect of a period of military service in one of the Armed Forces. In many cases this prospect was enhanced by the possibility of the draft. Each of the uniform services benefited directly or indirectly from this draft enhanced environment. As a result, the situation created a dependence on the draft as a principal source of military manpower. This pressure on draft eligible young men to either enlist in a service of their choice or face involuntary service in the Army created a climate in which voluntary enlistment flourished and candidates for service training were plentiful. For example, the Army used the induction system almost exclusively to supply enlisted recruits. At the same time the Marine Corps relied on volunteers to maintain its needed personnel level. Through the years the Navy's officer corps was one of the beneficiaries of the draft in terms of clear choices between enlisted and officer status if one qualified for an officer program. The choice was not whether one would enter the Navy but rather whether one would enter the Navy Officer Training Program if qualified or Naval enlisted status to avoid being drafted into the Army.

With the winding down of the War in Vietnam, public pressure to end the draft increased steadily during the late 1960's and culminated in the expiration of the authority to draft on July 1st, 1973. As a practical matter, the era of the All Volunteer Force (AVF) or "zero draft environment" began several months earlier as no men were drafted into the Armed Forces after December 1972.

The commitment of the Defense Department to the all volunteer concept was announced by Deputy Secretary of Defense William P. Clements Jr. in August 1973 when he said, "the all volunteer force which our society wants, in my considered judgement, can be achieved and maintained."^{1/} The events of the subsequent years have largely validated this statement.

The Navy, faced with a set of unknowns in effecting transition to the all volunteer force, commissioned an extensive research program to study various aspects of the transition and to attempt to predict some of the effects. This study is a product of that major effort entitled the Office of Naval Research AVF Manpower R&D Program. This report is the last of three reports and an article accepted for publication on progress made in the study of Naval Officer Retention in an all Volunteer Force Environment. It is a further assessment, on an Officer sample, of the possible impact of unit organizational climate and officer proficiency (Job Performance) on officer decisions to resign or not at the expiration of the initial period of obligated service.

The study was envisioned as a longitudinal project over a five year period of transition from a draft enhanced environment to an all volunteer force environment. A five year period was selected because it is the longest period of obligation derived from any commissioning source of Naval officers: the U.S. Naval Academy. Termination of the study prior to the collection of data for the five year period precludes analysis of the full transitional period. Nevertheless, the data gathered have been analyzed toward predicting those numbers of young officers approaching or having reached their minimum obligated service who will elect to become careerists.

Footnotes

- 1/ William P. Clements, Jr., quoted in U.S. News, 75:41,
August 6, 1973.

II. BACKGROUND

The first study in this series treated the retention experience of those officers in the third and fourth quarters of fiscal year (FY) 1973. This was a truncated group because the study did not begin until January 1, 1973. The second phase of the study examined the retention experience of those officers whose expiration of obligated service occurred during FY 1974, called MSR 1974. Thus, we had half of MSR 73 and all of MSR 74 under observation at the beginning of this third study phase which was directed at MSR 75 (FY 1975) or, in other words, those officers whose minimum service requirement initial date (MSRI) occurred during the period July 1974 - June 1975.

A. THE NAVAL OFFICER RETENTION PROBLEM--AN UPDATE

We have previously described three reasons why the career decisions of young Naval officers were chosen for study. First was the fact that improved retention in general and selective retention in particular is still necessary as indicated by the retention statistics which follow. Second, the initial career decision is viewed as critically important to selective retention and, therefore, results can be expected to have applicability to Navy officer groups further along their career paths. Third, it became evident after more than a year in the AVF environment that efforts to retain increased numbers of line warfare officers of the type under investigation in this study had not met with any dramatic success. After one additional year in the AVF environment, this statement is still true. As a

consequence, the possibility of developing information upon which improved selective retention strategies can be based is considered well worth further exploration. To these three factors we can now add a fourth reason for studying career decisions. We will conclude in this phase that the basic unit for studying retention strategies for young naval officers is not the year but more likely the quarter in which completion of minimum obligated service occurs. The fine tuning necessary for maximum benefit of a selective retention strategy does not appear to be favorably derived from a unit as gross as the year. A discussion of this point follows in Chapter IV.

The evolution of the retention problem for fiscal years 1967 through 1975 is shown in Tables II-1, II-2 and II-3 following.^{1/} Although there has been some improvement in retention in the pilot and submarine communities, retention is still a problem. The increase noted in the surface community is more apparent than real and results in part from deleting the non-surface warfare qualified officers (110x) from the retention calculation. It is possible that these non-surface warfare qualified officers (whatever the reason) are more likely to leave the service than their warfare qualified peers; however, statistical evidence is lacking to support this possibility.

B. CURRENT METHOD OF DETERMINING NAVAL OFFICER RETENTION

Retention rate is defined as the ratio of officers in a given category on active duty at MSR plus two years to the same category of officers in the beginning inventory adjusted for involuntary losses. Retention is calculated at MSR plus two years. A fuller discussion of retention as differentiated from the concept of "continuation" is presented in Annex A.

II-2



	FY									
	67	68	69	70	71	72	73	74	75	
TOTAL	57%	43%	31%	25%	27%	34%	43%	44%	45%	
Source										
USNA	80%	66%	53%	51%	53%	51%	63%	63%	69%	
AOC	47%	36%	24%	18%	15%	22%	32%	34%	36%	
NROTC (R)	63%	48%	27%	18%	24%	35%	56%	55%	48%	
NROTC (C)	42%	34%	23%	12%	13%	13%	41%	40%	43%	
NAVCAD	54%	36%	30%	27%	26%	33%	36%	*	*	
OCS	75%	58%	40%	15%	35%	31%	38%	-	-	
Combined Regular Sources	72%	59%	40%	34%	39%	43%	59%	60%	60%	
Combined Reserve Sources	52%	37%	28%	21%	22%	29%	35%	36%	37%	

NOTES: (1) A loss to the Pilot Community does not necessarily imply a loss to the Navy since some intra-service transfers to other communities do take place.

(2) *NAVCAD input discontinued in FY 74.

Table II-1: PILOT RETENTION DATA
(Officers at Minimum Service Requirement + 2 years)

	FY							
	68	69	70	71	72	73	74	75
TOTAL	58%	50%	33%	33%	41%	47%	39%	41%
<u>Source</u>								
USNA	60%	58%	42%	42%	50%	60%	-	50%
ROTC (R)	55%	41%	23%	21%	32%	28%	26%	-
OTHER	67%	36%	31%	39%	35%	40%	-	23%
Combined Regular Sources	57%	51%	34%	34%	43%	33%	26%	54%
Combined Reserve Sources	60%	25%	17%	11%	12%	5%	-	8%

NOTES: (1) A loss to the Nuclear Submarine Community does not necessarily imply a loss to the Navy since some intra-service transfers to other communities do take place.

(2) The majority of nuclear submarine officers are from regular commission sources.

(3) Rates prior to FY 70 are estimated rates used for comparative purposes. Because of the large numbers of indirect inputs from year groups into nuclear power training prior to FY 64, establishment of exact retention rates for FY's 68-69 using the present standard (MSR + 2) is not possible.

(4) The blanks in Submarine Community are due to several things: an increase in OBLISERV as a result of submarine training, increase in OBLISERV of USNA graduates and OCS graduates in 1974 and the increase of OBLISERV for NROTC graduates in 1975.

Table II-2: NUCLEAR SUBMARINE WARFARE SPECIALTY DATA
(Officers at Minimum Service Requirement
+ 2 years)

	FY									
	67	68	69	70	71	72	73	74	75	
TOTAL	20%	17%	18%	16%	17%	14%	14%	14%	30%	
<u>Source</u>										
USNA	70%	65%	53%	45%	53%	51%	42%	--	60%	
NROTC (R)	22%	25%	28%	26%	25%	25%	42%	27.4%	47%	
NROTC (C)	14%	11%	10%	--	11%	16%	20%	11.5%	15%	
OCS	15%	11%	11%	8%	9%	5%	7%	7%	14%	
ROC	26%	36%	17%	14%	17%	21%	20%	19%	23%	
NESEP	100%	57%	73%	62%	44%	51%	100%	59%	86%	
Combined										
Regular										
Sources	42%	40%	43%	39%	38%	40%	46%	35%	59%	
Combined										
Reserve										
Sources	16%	12%	12%	10%	11%	8%	9%	9%	16%	

NOTES: (1) A loss to the Surface Warfare Community does not necessarily imply a loss to the Navy, since some intra-service transfers to other communities do take place.

(2) There is no YG 68 from the USNA as a result of an OBLISERV increase to 5 years.

Table II-3: SURFACE WARFARE SPECIALTY RETENTION DATA
(Officers at Minimum Service Requirement
+ 2 years)

C. FACTORS INFLUENCING CAREER DECISIONS

Career motivation factors have been a focus of Navy personnel research for more than a decade. Studies have indicated that many, rather than a few personal, organizational, economic and social factors influence an individual's decision to make the Navy a career. See Annex B for a brief discussion of factors selected for study in this research.

Footnotes

- 1/ Unpublished data obtained from the Bureau of Naval Personnel (Pers-402d), August 1976.

III. THE STUDY METHOD

This chapter includes a description of the methodology used to accomplish the study objectives. It contains a discussion of the composition of the target sample, the reason for its selection and some of its characteristics in terms of its relationship with the officer population. Factors impacting the target sample and their effects on the study are also noted. The method and techniques used to collect the data are explained along with a description of the measures of officer performance and organizational climate.

A. THE STUDY OBJECTIVES

The objectives of the study remained unchanged for Phase III, viz: to assess the effect and impact of unit organization climate and job performance on young Naval officers' decisions to make the Navy a career. Toward these objectives the following hypotheses were formulated for consideration:

- H₁ There is no difference between young officers who decide to remain in the Navy and young officers who decide to leave the Navy in terms of job proficiency.
- H₂ There is no difference between young officers who decide to remain in the Navy and young officers who decide to leave the Navy in terms of their perceived organization climate.

B. CONSTRAINTS

The following constraints were imposed to focus the study on the target population:

- The phase of the study was limited to Naval officers whose Minimum Service Requirement or the point at which career decisions were to be made occurred between July 1, 1974 and June 30, 1975, i.e., MSR in FY 1975 (MSR 75).
- The study was limited to unrestricted line officers in the surface, submarine and aviation (pilot) communities.
- The study was limited to four source groups which supply new Naval officers: U.S. Naval Academy (USNA), Naval Reserve Officer Training Corps Scholarship (NROTC-R), Officer Candidate School (OCS), and Aviation Officer Candidate (AOC) training.

C. ASSUMPTIONS

Other factors which may be nominated as influencing career decisions, beyond the scope of this study, provided the rationale for the following assumptions:

- The presence or absence of personal factors influencing early career decisions, e.g., health, wife's opinion, father's occupation were equally distributed among the sample of officers chosen for this study.
- Each officer in the sample was equally likely to encounter "tough" and "easy" supervisor evaluators of his or her performance.
- Each officer in the sample was equally likely to encounter strong Navy organizational units early in his or her career.
- The sample of Naval officers under study had the same career motivation factors beyond the control of the Navy, such as compensation and the state of the national economy, as all other Naval officers in All Volunteer Force Environments through 1975.

D. THE TARGET SAMPLE

Since the line warfare community size is the significant determinant of all other community sizes, the composition of the sample is illustrated in Table III-1 which follows and represents the entire number of those officers meeting the sample criteria in the total line warfare officer population and available for study.

<u>Designator</u>	(01) <u>USNA</u>	(03) <u>AOC</u>	(04) <u>NROTC(R)</u>	(06) <u>OCS</u>	<u>Total</u>
111X Surface	297	6	375	869	1,547
112X Submarine	86	-	51	27	164
131X Aviation	119	328	56	4	507
Sample N =	502	334	482	900	2,218

Table III-1: COMPOSITION OF THE SAMPLE BY
SOURCE AND DESIGNATOR

The study sample was obtained by a computer run from the Bureau of Naval Personnel Officer Master File. The file was searched and names meeting grade, designator, source and MSRI criteria were selected consecutively until all names were drawn. The random character within grade is enhanced by the continuous mixing effect of accession, promotions, training and attrition and by the fact that the initial input is in Social Security Number (SSN) order. It was assumed that geographic, demographic and other biases were minimized by the diversity of the officer input and the randomness of SSN occurrence within source of initial peer group.

E. THE OFFICER POPULATION

The magnitude of the retention problem in the line warfare communities was defined in Chapter II. In order to understand why the study was restricted to the line warfare segments of the officer corps, an explanation of the make up of the officer population is necessary.

The size of the various officer and enlisted populations in the Armed Forces is determined in accordance with appropriate federal laws. With the size of the active list of the general line set by statute, the staff corps, the restricted line, and special duty officers derive their size by specified percentages of the size of the unrestricted line. This was the first of two reasons why the unrestricted line was chosen as the target population.

A second concern was the nature of the officers themselves. The study was intended to establish data about the career choice of the professional Naval officers. The other types of officers (Supply, Medical, Law, Engineering, etc.) are more accurately described as Naval officer professionals. As such, they tend to exhibit characteristics associated with the professions in response to "professional" types of duty, different job environments, frequently different pay scales, and different inducements to make the Navy a career. As a consequence, our sample was drawn from the line warfare communities of surface, sub-surface (submarine) and aviation (pilot). The fourth line warfare community, Special Warfare, consisted of less than 200 men at the beginning period of the study and was not considered quantitatively significant for purposes of the sample.

Our target sample suffered some minor, "natural" losses such as deaths, humanitarian separations, transfers from the

line warfare community, etc. These kinds of losses account for the difference in the number of names on the computer listing, 2238, and the number described in the target sample of 2218 as previously shown in Table III-1 above.

F. THE FY 1973, FY 1974, AND FY 1975 MSR GROUPS

Officers enter the Navy on an initial tour of active duty during a given year and with few exceptions are first identified by Year Group, i.e., year of commissioning. As time passes, however, the officer becomes part of a population which is a heterogeneous mixture of inputs from several year groups and sources. This results from obligated service varying from individual to individual because of changes incurred through training and/or post-graduate education. It is impractical to track individuals by input year group. Therefore, the Minimum Service Requirement Initial date (MSRI) was developed in the Bureau of Naval Personnel, and shows the end of initial obligated service for all officers. This MSRI date is attached to an officer's record two years prior to the end of the officer's obligated service; however, it is dropped at MSR+2 when an officer's permanent career status is assumed.

As a result of adding the FY 1975 officers, the overall study now has three samples--FY 73, FY 74 and FY 75. Table III-2 shows the loss experience of these three groups. MSR 73/3 and 73/4 losses are summed for the two quarters. All subsequent MSR 73 losses, all MSR 74 losses and MSR 75 losses are shown by quarter occurring.

As shown in the table, there is little quantitative comparability in the loss experience of the three MSR groups

		<u>73</u>						<u>74</u>						
		3rd-4th						1st	2nd	3rd	4th			
		<u>Begin</u>	<u>Sub-</u>			<u>Begin</u>			<u>L</u>	<u>L</u>	<u>L</u>			
		<u>Strength</u>	<u>Total</u>			<u>Strength</u>								
			<u>S</u> <u>L</u>											
<u>MSR 1973</u>		01	79	69	10	69	10	4			2			
	111X	04	73	55	18	55	17	0			2			
		06	60	56	4	56	12	5			3			
		01	73	60	13	60	4	2			7			
	112X	04	34	30	4	30	4	1			1			
		06	20	14	6	14	5	0			2			
		01	79	71	8	71	5	0			2			
	131X	04	76	64	12	64	5	3			2			
		06/03	69	62	7	62	4	1			2			
<u>MSR 1974</u>		01				214	0	1			20			
	111X	04				271	11	5			71			
		06				110	29	21			8			
		01				52	0	0			12			
	112X	04				57	0	1			16			
		06				29	4	10			6			
		01				106	1	2			8			
	131X	04				123	4	8			9			
		06/03				276	40	44			15			

LEGEND: S = Stayer
L = Leaver

Table III-2: STAYER/LEAVER POPULAT

<u>74</u>				<u>75</u>								Aggregate	
1	3rd	4th		1st	2nd	3rd	4th	Sub-		Aggregate		Total	
Sub-				Begin				Sub-					
Total				Strength				Total					
<u>L</u>	<u>L</u>	<u>S</u>	<u>L</u>		<u>L</u>	<u>L</u>	<u>L</u>	<u>L</u>	<u>S</u>	<u>L</u>	<u>S</u>	<u>L</u>	
0	0	53	16	53	0	0	1	3	49	4	49	30	
0	0	36	19	36	3	0	1	3	29	7	29	44	
0	0	36	20	36	1	2	0	1	32	4	32	28	
1	0	46	14	46	2	0	0	6	38	8	38	35	
0	1	24	6	24	0	0	0	2	22	2	22	12	
0	2	7	7	7	0	0	0	0	7	0	7	13	
0	2	64	7	64	1	0	0	0	63	1	63	16	
0	2	54	10	54	2	1	0	1	50	4	50	26	
1	2	54	8	54	2	0	0	1	51	3	51	18	
1	20	192	22	192	17	6	4	4	161	31	161	53	
10	71	174	97	174	40	8	4	10	112	62	112	159	
20	8	32	78	32	0	0	2	1	29	3	29	81	
1	17	39	13	39	2	1	3	2	31	8	31	21	
1	17	39	18	39	11	3	2	3	20	19	20	37	
3	0	6	23	6	1	0	0	0	5	1	5	24	
3	0	92	14	92	3	2	0	1	86	6	86	20	
10	0	92	31	92	4	2	2	0	84	8	84	39	
15	15	162	114	162	13	6	1	3	139	23	139	137	
				01	252	0	1	2	26		223	29	
				111X 04	317	15	8	9	40		245	72	
				06	668	66	24	19	64		495	173	
				MSR 1975 01	86	0	0	0	14		72	14	
				112X 04	44	2	0	2	6		34	10	
				06	34	1	4	2	3		24	10	
				01	115	6	7	1	2		99	16	
				131X 04	52	1	4	1	0		46	6	
				06/03	259	22	16	1	3		217	42	

TER POPULATION BY QUARTER FOR FY 73, FY 74 AND FY 75

nor was any expected. Differences and similarities of the three samples covered by the study objectives and the comparative degree of success of the different predictor models using data from each of the three years is discussed in Chapter IV.

Table III-2 presents some loss patterns which are interesting to note. MSR 73 was tracked through MSR+2 years, end of FY 75, at which time at least 80% of those officers who leave the Navy are considered to have left. In the case of our MSR 73 sample, the retention percentage for the Surface (111x) officers is 51.9 percent compared with total MSR Navy Surface lieutenant retention percentage of 30 percent as shown in Table II-3 at a comparable point in time. It should be pointed out that MSR 73 contained only FY 73 third and fourth quarter officers; however, the numbers in the Surface sample by source and designator were of similar magnitude. The 06 source (OCS) was slightly under represented, but this was all those individuals in third and fourth quarter who met the study criteria. MSR 74 at the MSR+1 year point, one year short of the point for "career designation," had 50.8 percent retention; however, with one year to go the retention figure is nearly certain to decrease and approximate more closely Navy historical data. Other quick comparisons of MSR 73 with overall Navy retention percentages within the same community and same rank are: MSR 73, Submarine--52.8 percent, all Nuclear Submarine lieutenants--36 percent; MSR 73, aviation (Pilots)--73.2 percent, all Aviation lieutenants (Pilots)--52%. No conclusion is possible as to why these percentages differ except for the facts that they are derived differently, have different statistical bases and have different criteria. The important thing is that they do differ substantially.

This question is a study by itself; however, in this investigation it has been shown that the continuous tracking of individuals through and beyond the career designation point is feasible and desirable and could possibly lead to improved retention forecasting.

G. THE SURVEY INSTRUMENT

An estimate of each officer's perception of his organization's climate was obtained with the Organizational Climate Audit. The OCA is a forty-item, paper and pencil, observation reporting inventory designed to measure the internal climate of an organization. A copy of the OCA and the Manual were provided in the initial technical report. The instrument is a survey of five critical areas of management practice which shape organization effectiveness (mission accomplishments) and organization efficiency (internal process, methods and policy). The forty items are grouped equally in assessment of the five areas developed in earlier studies. These five areas which are called factors are:^{1/}

1. UPWARD INFLUENCE - DOWNWARD INVOLVEMENT

There is good general satisfaction among subordinates with the way they are treated by their superior. They feel he is constructive and fair in helping them; they are able to work out problems with him. The "boss" is seen as willing to share power. He is responsive to influence from members of his group.

2. MUTUAL SUPPORT

The subordinates have high confidence and trust in their supervisor and with each other. There is good teamwork and helpfulness within the group. Problems are tackled with joint action.

3. ENCOURAGEMENT OF INITIATIVE

The actions of the superior demonstrate that he believes his subordinates will act in a mature, self-controlling, responsive manner. Subordinates are able to communicate effectively and above board with each other and their superior.

4. ORGANIZATION IMAGE

The organization's management understands the work and problems of the unit. Information flows easily to the work unit concerning plans and problems facing the organization; information flows easily from the work unit to a listening and responsive management.

5. REWARDS AND RECOGNITION

Definite rewards and means of recognition exist for specific improvement objectives which are understood and accepted by the unit. Rewards and recognition are used fairly and as often as output or quality are raised. Opportunities exist for promotions based upon merit as well as experience. Correction of mistakes and discipline are handled fairly.

The OCA produces three types of quantified data which may prove of value in predicting whether or not young officers decide to remain in the Navy. First, each item produces a numerical score which, in combination with other item scores may yield a reliable and valid predictor of officer career decisions.

Second, each item score can be arithmetically totalled for an OCA Total Score which can theoretically vary from a low of 40 to a high of 200. This measure was our initial nomination as a predictor variable and is used in the models.

Third, each OCA item relates to one of the five factors or constructs of organizational climate. Eight items relating to a single factor, placed two on each of the four pages of the inventory, are scored and totalled to produce a particular factor score. Each respondent, therefore, can have five separate factor scores each ranging from a low of 8 to a high of 40.

Item assignment to factors was in part determined through factor analysis of pilot study results.^{2/}

A factor analysis conducted after Phase I suggested some slight change in Factor loadings; however, in the

interest of preserving the integrity of the instrument through all phases of the study, the decision was made to retain the original items, item position in the instrument, and assignment to factors.^{3/}

The OCA also provides generalized profiles of perception of organizational climate across organizational units. These aggregate summaries, while not of primary interest in this study, do provide information on how young officers electing to stay in or leave the Navy view their organization at a given point in time. An example of these profiles is shown in Annex C.

H. THE OFFICER FITNESS REPORT

A measure of officer proficiency was obtained from Officer Fitness Reports (OFR) for each officer in the sample. The information was obtained from official records of each officer on file in the Records Division of the Bureau of Naval Personnel. The sensitivity and highly personal nature of this information was recognized and all personalizing data, including the name of the reporting senior, was omitted. A discussion of this procedure and the nature of the OFR is contained in Annex D.

Footnotes

- 1/ Harry D. Kolb. Evaluating and Solving the Problems Of Organization Improvement: A Handbook for Managers. Humble Oil and Refining Company, 1968. pp. 71-72. Humble Oil, Houston, Texas.
- 2/ Data Solutions Corporation, "Interim Team Research and Evaluation Progress Report," September, 1970, Postal Service Management Institute, Contract NC-PSMI-70-29, pp. 37-43.
- 3/ Data Solutions Corporation, "Technical Report," December 1973, Office of Naval Research, Contract N00014-73-C-0261, Annex B.

IV. THE STUDY RESULTS

The results of the last phase of the study are discussed in this section in the context of the emphasis placed on the present aspect of the study, i.e. predictor model performance. To provide perspective, Phases I and II of the study are also described briefly.

A. COLLECTION OF THE STUDY DATA

A listing of the names of the officers meeting the sample criteria was obtained from the BuPers Officer Master File. The procedure used is described in Chapter III. In Phase I, of 754 questionnaires mailed out, 583 were returned for a 77 percent response. In Phase II, the total number of officers in MSR 74 meeting the study criteria was used for the sample with 1,525 questionnaires sent out and 1,317 responses received for a return percentage of 86 percent. The response from MSR 75 again has been uniformly excellent (84 percent return) indicating a high degree of cooperation on the part of the survey respondents. Table IV-1 shows the return percentages by MSR quarter.

OCA MAIL-OUT/RESPONSE			
<u>Quarter</u>	<u>Out</u>	<u>In</u>	<u>%</u>
1	548	420	77
2	440	371	84
3	145	125	86
4	1,085	949	87
Total	2,218	1,865	84

Table IV-1: SURVEY MAIL-OUT/RESPONSE
PERCENTAGE BY MSR
QUARTER -- FY 1975

Additional shrinkage of the sample size was experienced in matching the respondents and the performance records. This shrinkage is accounted for by early losses, obliterated codes and marred OCA's, unavailability of performance records for official reasons, non-matchable records, e.g., incorrect designator or Social Security Number, and line warfare community losses occurring after the study commenced. This shrinkage is described below:

FY 1975 MSR SAMPLE SHRINKAGE

- 2,238 - number of officers meeting sample selection criteria
- 2,218 - number of addresses of mail-outs (after subtracting 20 pre-survey losses)
- 1,865 - number of survey respondents
- 1,827 - number in sample (matched OCA's and OFR's).

The composition of the MSR 75 sample by source and designator is shown in Table IV-2.

SOURCE DESIGN.	USNA (01)	NROTC(R) (04)	AOC/OCS (03) (06)	TOTAL
1110X/111X	252	317	668	1,237
112X	86	44	34	164
131X	115	52	259	426
TOTAL	453	413	961	1,827

Table IV-2: MSR 75 STUDY SAMPLE COMPOSITION BY SOURCE AND DESIGNATOR

B. PRIOR STUDY RESULTS

The FY 1973 sample of Quarters 3 and 4 was used as a pilot study to select the most appropriate predictor measures, e.g. an average of the three most recent Officer Fitness Reports (AFR) as the performance index to use throughout the study. An investigation of the relationship between officer proficiency measures and perceptions of organizational climate provided evidence that the distribution of OCA scores for officers with an AFR of seven and above was different from the OCA scores of officers whose AFR was below seven. A full discussion of these results is contained in Annex E.

The initial availability of a full year of study data occurred with MSR 74 when officers with MSRIs in all four quarters were surveyed. The study emphasis during that year was not only to test the data for differences between stayers and leavers but, more importantly, to develop predictor models with which to improve the capability of predicting stayers. Since current retention data are gathered after the fact, prediction for planning purposes is either extrapolation of these data or by chance, i.e., the flip of a coin. Under these circumstances a predictor model would be a useful management tool for manpower and budget planning. Several models were developed for each of four modelling techniques. The model judged as performing best in classifying stayers and leavers was that obtained by Discriminant Function Analysis. The models developed for the MSR 73 and 74 groups were found to improve over chance the determination of stayers by 25 and 35 percent respectively. A complete discussion of these results is included in Annex F.

C. RESULTS OF TESTING MODEL PREDICTION ACCURACY

This phase of the study is aimed at shedding light on two main questions concerning the predictor models. First, as time passes, what happens to the model's accuracy of prediction? Second, how well do the models built upon data from one MSR group predict staying and leaving in another MSR group?

1. Model Predictions Through Time

All of these predictor models are built upon measures of officer job proficiency and perceptions of their unit's organizational climate gathered as nearly as possible just prior to each officer's particular date of satisfying his Minimum Service Requirement. The first question becomes, "how well did MSR 73 and MSR 74 model predictions of stayers and leavers hold up when applied again after another year of tracking each officer in the study?" Table IV-3 shows the comparisons of the MSR 73 model applied to MSR 73 + 1 and MSR 73 + 2 and Table IV-4 displays the results of the MSR 74 model application to MSR 74 and MSR 74 + 1.

It should be noted that initial prediction by the model of an individual officer as a stayer who did stay at that point in time while counted as "correct" could become "incorrect" with time i.e., the predicted stayer leaves the Navy between MSR + 1 and MSR + 2 years. In like manner, an officer initially predicted by the model as a leaver when in fact is a stayer at MSR + 1 and therefore the transaction is counted "incorrect" could become "correct" with time i.e. the predicted leaver does leave the Navy during the period between MSR + 1 and MSR + 2 years. In those cases where the initial prediction is stayer at MSR + 1 and the officer is a stayer at MSR + 2, the "correct" prediction is

MSR 73 + 1 YEAR N = 563*		MSR 73 + 2 YEARS N = 563	
<u>INITIALLY CORRECT</u>		<u>FOLLOW-UP CORRECT</u>	
Predicted Stayer Is Stayer	N = 326 (57.9%)	Stayers Who Did Stay	N = 292 (51.9%)
Predicted Leaver Is Leaver	N = 78 (13.8%)	Leavers Who Left Remains The Same	N = 78
		SWITCH: Initially Incorrect Predicted Leave-Stay, But Became Correct, Officer Left	
			N = 10
<u>TOTAL CORRECT</u>	<u>N = 404 (71.7%)</u>	<u>TOTAL CORRECT</u>	<u>N = 380 (67.4%)</u>
<u>INCORRECT</u>		<u>FOLLOW-UP INCORRECT</u>	
Predicted Stayer Is Leaver	N = 99 (17.7%)	Stayer Is Leaver Remains The Same	N = 99
Predicted Leaver Is Stayer	N = 60 (10.6%)	Leaver Predicted As Stayer Who Left	N = 50
		SWITCH: Stayer Predicted As Stayer Who Left	N = 34
<u>TOTAL INCORRECT</u>	<u>N = 159 (28.3%)</u>	<u>TOTAL INCORRECT</u>	<u>N = 183 (32.6%)</u>
SUMMARY:		PREDICTION CHANGE = -6.0%	
STAYER CORRECT --		PREDICTION CHANGE = +2.5%	
LEAVER CORRECT --		PREDICTION CHANGE = -4.3%	
TOTAL CORRECT --			
* Combined Experimental and Holdout Groups.			

Table IV-3: COMPARISONS OF MSR 73 MODEL PREDICTION ACCURACY
AT MSR 73 + 2 AND MSR 73 + 3

While aware of the dangers of statistical fold back, we have combined the Experimental and Holdout Groups in order to permit an across-year comparison of each officer in the sample.

MSR 74
N = 1238*

MSR 74 + 1 YEAR
N = 1238

FOLLOW-UP CORRECT

Stayers Who Did Stay N = 622 (50.2%)
Leavers Who Left Remain The Same N = 129
SWITCH: Initially Incorrect Predicted Leave-Stay, But Became Correct, Officer Left N = 19

TOTAL CORRECT

N = 1030 (93.2%)

TOTAL CORRECT

N = 770 (62.1%)

FOLLOW-UP INCORRECT

Stayer Is Leaver Remains The Same N = 64
Leaver Predicted As Stayer Who Left N = 125
SWITCH: Stayer Predicted As Stayer Who Left N = 279

TOTAL INCORRECT

N = 208 (16.8%)

TOTAL INCORRECT

N = 468 (39.2%)

SUMMARY: STAYER CORRECT -- PREDICTION CHANGE = -22.6%
LEAVER CORRECT -- PREDICTION CHANGE = +1.5%
TOTAL CORRECT -- PREDICTION CHANGE = -10.7%

* Combined Experimental and Holdout Groups.

Table IV-4: COMPARISONS OF MSR 74 MODEL PREDICTION ACCURACY
AT MSR 74 AND MSR 74 + 1

While aware of the dangers of statistical fold back, we have combined the Experimental and Holdout Groups in order to permit an across-year comparison of each officer in the sample.

confirmed--at least to that point in time. However, where the initial model prediction is a leaver who in fact is a leaver at MSR + 1 (correct) there can be no possible change in prediction accuracy at MSR + 2. Finally, where the initial prediction is a stayer and in fact the officer is a leaver at MSR + 1 (incorrect), there likewise can be no possible change in prediction accuracy at MSR + 2.

In summary: Table IV-3 shows a slight deterioration of the model's prediction accuracy from MSR 73 + 1 to MSR 73 + 2 by 4.3 percent. The model's leaver prediction increased slightly by 2.5 percent reflecting the change of leavers who were initially called stayers but who subsequently became leavers. Stayer prediction, after another year of tracking dropped 6 percent. Table IV-4 shows similar but sharper degradation in stayer prediction by the model in a subsequent year on MSR 74 data. The change here is 22.6 percent. As before there was a slight improvement in leaver predictions of +1.5 percent reflecting again the change of individuals called leavers who stayed but became leavers the following year. Overall, the total correct predictions dropped 10.7 percent.

Based on these data, we conclude that models developed on an MSR group deteriorate in their capacity to predict stayers correctly within this same group after a substantial period of time.

2. Prediction Model Built Upon One MSR Group Tested Upon Another MSR Group

How well does the MSR 73 model predict which MSR 74 officers tracked to MSR + 1 are stayers or leavers and how well does the MSR 74 model predict which MSR 75 officers will be stayers and leavers after only a minimum of tracking, i.e. first quarter FY 75 tracked for four quarters, fourth quarter FY 75 tracked for 1 quarter? This is the question of

applicability of a model developed on one group to a second group of the same chronological age as the original group was during model development.

Table IV-5 shows that there is substantial degradation of model performance when the MSR 73 + 1 model is tried on MSR 74 + 1 data. Model performance in stayer/leaver prediction as a percentage of MSR total sample is shown for both groups. MSR correct stayer prediction was lower for MSR 74 although correct leaver prediction for MSR 74 was slightly higher than that of the MSR 73 Holdout group. This is an anomaly and has no particular significance in view of the fact that the models were designed to maximize stayer prediction. There was also a substantial increase in MSR 74 over MSR 73 in the misclassification of leavers as stayers. Almost one-third were thus misclassified.

Table IV-6 shows similar data comparisons for MSR 74 Experimental/Holdout groups and MSR 75. The same inferences can be drawn about deterioration in model performance when using the model developed on MSR 74 for MSR 75 data. At the time of testing there were 60.7 percent correct predictions on MSR 75 compared to 39.3 incorrect predictions. On the other hand, the MSR group on which the model was developed (MSR 74) had correct predictions in the 80-90 percent range while the misses were of the order of 15 percent.

In summary, we can conclude on the basis of these data that models developed on one MSR group suffer substantial deterioration in performance when applied to other MSR groups. This may suggest that the MSR year, as a division for testing, is too gross to attempt to develop and refine a predictor model for officer retention.

<u>PREDICTIONS</u>	<u>GROUPS</u>		
	<u>MSR 73 + 1 YEAR EXPERIMENTAL GROUP</u>	<u>MSR 73 + 1 YEAR HOLDOUT GROUP</u>	<u>MSR 74 + 1 YEAR</u>
CORRECT			
Predicted Stayer is Stayer	N = 151 (56.8%)	N = 176 (59.1%)	N = 519 (41.9%)
Predicted Leaver is Leaver	N = 44 (16.5%)	N = 34 (11.4%)	N = 190 (15.4%)
Subtotal	195 (73.3%)	210 (70.5%)	709 (57.3%)
INCORRECT			
Predicted Stayer is Leaver	N = 50 (18.8%)	N = 49 (16.4%)	N = 381 (30.8%)
Predicted Leaver is Stayer	N = 21 (07.9%)	N = 39 (13.1%)	N = 148 (11.9%)
Subtotal	71 (26.7%)	88 (29.5%)	529 (42.7%)
GRAND TOTAL	266 100%	298 100%	1238 100%

Table IV-5: PREDICTED MODEL DEVELOPED WITH DATA OBTAINED AT
FY 1973 MSR DATES TESTED UPON NAVAL OFFICERS
TRACKED TO THE FY 1974 MSR PLUS ONE YEAR POINT

PREDICTIONS	GROUPS		
	MSR 74 + 1 YEAR EXPERIMENTAL GROUP	MSR 74 + 1 YEAR HOLDOUT GROUP	MSR 75 LESS THAN 1 YEAR GROUP
CORRECT			
Predicted Stayer is Stayer	N = 443 (72.9%)	N = 458 (72.7%)	N = 918 (50.2%)
Predicted Leaver is Leaver	N = 56 (09.2%)	N = 73 (11.6%)	N = 191 (10.5%)
Subtotal	499 (82.1%)	531 (84.3%)	1109 (60.7%)
INCORRECT			
Predicted Stayer is Leaver	N = 80 (13.1%)	N = 64 (10.1%)	N = 181 (09.9%)
Predicted Leaver is Stayer	N = 29 (04.8%)	N = 35 (05.6%)	N = 537 (29.4%)
Subtotal	109 (17.9%)	99 (15.7%)	718 (39.3%)
GRAND TOTAL	608 100%	630 100%	1827 100%

Table IV-6: PREDICTOR MODEL DEVELOPED WITH DATA OBTAINED AT
FY 1974 MSR DATES TESTED UPON FY 1975 NAVAL OFFICERS
SOON AFTER REACING THEIR MSR DATES

D. DISCUSSION OF MODEL TESTS

In appraising the results of the model tests, the reader is reminded that the experimenters were playing with a stacked deck. That is to say, in almost all the possible comparisons, any change in model performance would more likely result in deterioration.

Secondly, these results suggest that the use of models on an MSR year group may be an application which is too gross to be maximally useful. After detailed analysis of retention data over a three year period, we believe that the MSR quarter year may be a more appropriate chronological division by which to realize the potential for predicting stayers by models. Greater homogeneity by quarter is present in that NROTC(R) and USNA officers tend to have MSRs bunched in quarters three and four with OCS, AOC and other sources more likely to fall in first, second and to some lesser extent third quarter.

Thirdly, study termination after the second year of model testing provides only two data points. It is impossible to conclude authoritatively the extent and degree of model performance on the basis of this one year comparison. In view of this, it is no accident that the study had a five year longitudinal design. The authors suggest that at some future time, the Navy may wish to take the experimental design and use it to test fully the hypothesis which generated our interest in the first place. At this time we can only state that the results do not disagree with the study hypothesis.

Finally, in the course of this study, the fact has been demonstrated that longitudinal tracking of the individual young officer is feasible and within the reports capability presently in hand in the Bureau of Naval Personnel. The

everyday application of this technique could prove of value in determining what tracks or career patterns, when correlated with individual performance and perceptions of unit organizational climate, provide the greatest return on investment in young naval officer retention.

V. FINDINGS AND CONCLUSIONS

The results of this study provide additional evidence that intrinsic characteristics of the immediate job environment influence career decisions. Young naval officers, when they reach an early career decision point, who like their organization and whom the organization believes are performing well, have a greater probability of making the career decision to remain with the organization than do those who perceive their unit organizational climate less favorably and whose performance the organization has judged comparatively lower.

A caution must be offered to those wishing to generalize these results. The findings and conclusions of this study are based on data gathered from last half MSR 73, MSR 74 and MSR 75. The stayer classifications are tentative and further shifts can be expected from all MSR groups, although MSR 73 should be fairly well stabilized and MSR 74 should be approaching a similar condition when checked with FY 76 attrition data. Based on historical experience, a second year of heavy losses in FY 76 can be expected for the MSR 75 group.

A. FINDINGS

Details of all findings of the study can be found in major findings of each prior technical report. The major findings of all phases of the study are stated below.

- The results of the first phase of this study validated the research design and documented a statistically significant difference between stayers and leavers in terms of their job performance and perceptions of unit organizational climate.

- During the entire course of this study, the feasibility of tracking the young naval officer has been demonstrated. The determination of the effect of various career tracks or patterns on personnel retention is a technique presently used in large companies in the private sector. This kind of focus on retention at the individual level as opposed to the macro level is consistent with the current emphasis on Navy manpower planning with such systems as NAMPS.
- Models were developed on two separate MSR Groups which improved over chance, by 25 percent and 35 percent respectively, the prediction of a stayers at that individual's MSRI.
- This final phase of the investigation of young officer retention indicated an expected deterioration in the models' performance as initially predicted stayers subsequently became leavers.
- With study termination after the second year of testing, there are only two data points. An authoritative assessment of the models' potential cannot be made on this limited comparison. At this point, our findings can only state that the results do not disagree with the study hypothesis.

B. CONCLUSIONS

- After looking at test results of the data collected, there is evidence to indicate that not only are the populations of young officers from three source groups in three warfare specialties different between MSR groups but also differences exist between subgroups. There appears to be a need to develop separate models for each subgroup within source and warfare specialty as well as different models for the FY quarters between MSRI and MSR + 2 years. Additionally, the evidence suggests the possibility of some nonlinear relationships between some of the subgroups and the predictor variables. Further investigation of this relationship appears warranted.

- It is reasonable to expect management at the unit level to be able to improve retention; however, there are practical limits to such efforts. To be cost effective, they must be part of an orchestrated effort involving all organizational levels through time. One would expect that organization policy concerning entry requirements, job change, promotion and training opportunities and competitive benefits will be supportive of unit retention improvement efforts and that management practice of various levels of the organization and across units is consistent in terms of emphasis and resource allocation to organizational climate improvement.
- The prediction of stayers based upon factors over which an organization has control is possible. The type of prediction used in this study, and the longitudinal tracking of the "retained individual," suggest that it is possible for management to calculate cost avoidance as a function of retention. Organizations can measure on a cost basis the retention success of every organizational unit. Periodic review of these data as an "early warning device" can be the basis for improvement actions at all organization levels coupled with policy planning as the organization's growth profile changes through time.
- The results of this study must certainly be due in part to the Navy's existing Human Resources Management Program and perhaps would be different in other times and for other organizations.

ANNEXES



ANNEX A

CURRENT METHOD OF DETERMINING NAVAL OFFICER RETENTION

A-1



Annex A

CURRENT METHOD OF DETERMINING NAVAL OFFICER RETENTION

Although the discussion of this subject appeared in a prior report, an understanding of the term retention is needed to appreciate fully the question of what is being studied and at what point in time.^{1/}

Even to many knowledgeable people in the Navy, the word retention implies a ratio of the number of people remaining to the number of the same kind of people starting measured through some period of time. This is not the case. Such a rate is actually the continuation rate and is specifically defined as the ratio of the number of officers in a specified group (source, specialty, etc.) at a specified time on active duty, to the number of officers in the same group at some prior time, not necessarily at commissioning. Continuation rates are calculated using the following formula:

$$C_t = \frac{A_t}{N}$$

where:

C_t = Continuation Rate for some time period t

A_t = Number of officers on active duty at time t

N = Number of officers in "starting" inventory.

The point in time at which obligated service ends, i.e., initial service requirement from commissioning or additional service requirements from aviation or submarine training, is called Minimum Service Requirement (Initial Date)--MSR or MSRI. This date provides the initial point in time at which Naval officers may make a career decision to stay in the Navy or leave. From this point on, officers on continuous active duty are counted as career officers.

Retention rate is defined as the ratio of officers in a given category on active duty at MSR plus two years to the same category of officers in the beginning inventory adjusted for involuntary losses.

If we denote by N_k the number of officers on active duty at MSR plus K years, by R_k the retention rate to MSR plus k years, and by L_k the involuntary loss up to MSR plus k years, then the retention rate to MSR + k years may be expressed as:

$$R_k = \frac{N_k}{N_0 - L_k}$$

Retention is calculated at MSR+2 since research has shown that approximately 80% of the officers who are going to leave the Navy have done so within two years of the expiration of their initial service obligation.^{2/} This provides a statistical indication of a general measure of career motivation.

Footnotes

- 1/ The information contained in this section is based on unpublished data obtained from the Bureau of Naval Personnel (Pers-402c), July 1973.
- 2/ George L. Henry and Roy B. Wethy, Optimized Cost Benefits Associated With Changes In Officer Retention: A Methodology, Washington, D.C. p. 17ff.

ANNEX B

FACTORS INFLUENCING CAREER DECISIONS

B-1



Annex B

FACTORS INFLUENCING CAREER DECISIONS

One of the current, more comprehensive efforts in this area is the study by the team from the Institute for Social Research, University of Michigan. In a technical report published in December 1973, Bowers considers some perceptions of naval officers regarding their organizational climate. He concludes that young officers, despite their basically positive, constructive relationships with supervisors and peers, view the Navy's organizational climate in relatively negative terms.^{1/} The facts developed in this study, as well as continuing meetings with knowledgeable managers in the Bureau of Naval Personnel and discussions with young officers, suggest that two important influences in career decisions are (1) how well the individual feels he or she is performing, and (2) how well he or she believes the Navy can meet his or her personal expectations. In view of the above, the factors chosen for study here--job proficiency and individual perception of organization climate--are increasingly germane to the retention issue. They were selected in the belief that young officers are:

- Determining their suitability for a Navy career in terms of how well they perform early career assignments.
- Forming opinions as to a Navy career based upon an extrapolation of their perception of their current organization's climate.

The current research seeks to determine if there is a meaningful difference between officers who decide to remain in the Navy and officers who decide to leave the Navy in terms of perceived organizational climate and job proficiency

as measured by the Officer Fitness Report and by a survey described in the chapter which follows. If a difference is found, positive actions could be initiated by Navy personnel managers towards increasing selectively the number of qualified young officers electing to stay in the Navy. For example, these actions could seek improvements in young officer job assignment (job challenge), unit effectiveness and efficiency through increased officer responsibility, and performance evaluation (reduction of bias from rater, by unit, and skewness of marks). Initiatives of this type, nominated by the Chief of Naval Personnel and implemented through the chain-of-command, could be specifically measured for their individual and collective impact. Clearly defined predictors of young officer retention, when coupled with a wide variety of career motivation and improvement of Navy life programs, would provide a powerful personnel management approach to increasing the probability of success of the All Volunteer Force concept.

Footnotes

- 1/ David Bowers, Expressed Preferences and Organizational Practices Experienced By Navy Officers, Ann Arbor, Mich. December 1973, p. 54.

ANNEX C

GRAPHIC SUMMARY OF ORGANIZATIONAL CLIMATE
PERCEPTIONS OF NAVAL OFFICERS THROUGH 4TH QUARTER
MSRI, FY 74 - BY TOTAL SAMPLE,
TOTAL STAYERS, TOTAL LEAVERS

C-1



Annex C

PERCEPTIONS OF ORGANIZATIONAL CLIMATE

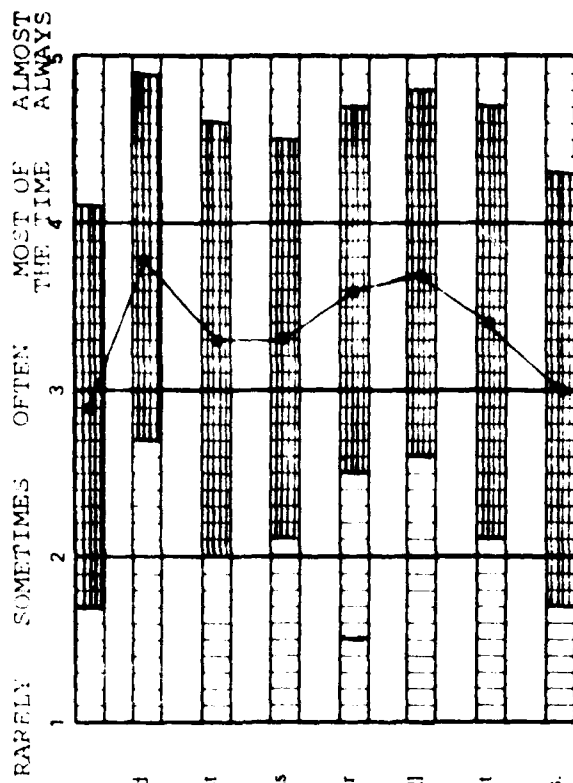
An estimate of each participating officer's perception of his organization's climate was obtained with the Organizational Climate Audit (OCA) instrument. Illustrated on the following pages are scales showing the plotted mean value of all responses to each OCA question for MSRI group--FY 74. Respectively, Figures C-1, C-2, and C-3 depict the individual question profiles for the total sample (stayers and leavers), total number of stayers, and finally, the total leaver population. The dark areas on the response scales represent the standard deviation or the dispersion of responses around the mean.

A visual comparison of Figures C-2 and C-3 will show that the patterns of the scores on each factor for stayers (MSR 74, N=965) and for leavers (MSR 74, N=273) are almost identical. However the leavers, as a group, have lower scores on every single question as compared with stayer scores.

As a starting point toward the improvement of unit organization climate, Figure C-1 reveals that all MSR 74 group officers (N=1,238) observe that improvement is required primarily in the area of Organization Image (questions 5, 12, 26, 30, 33 and 39). Questions 20, 22, 25 and 29 also indicate areas of improvement. Responses also show that Encouragement of Initiative and Upward Influence-Downward Involvement should be sustained. Questions 4, 9, 14 and 35 also indicate areas which should be sustained.

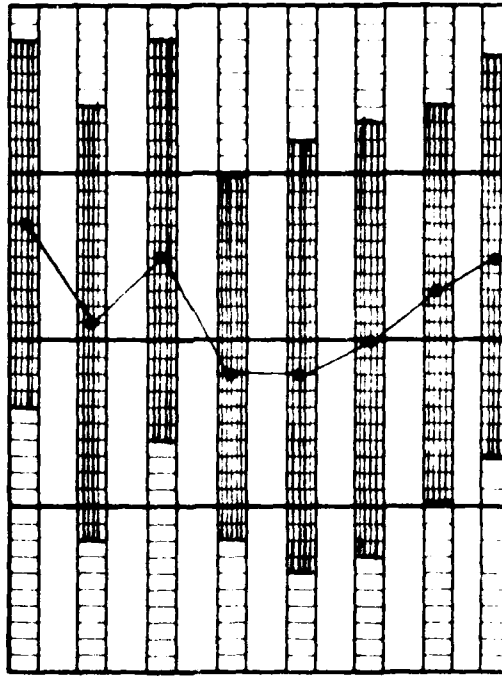
FACTOR 1 - Upward Influence - Downward Involvement

6. The boss spends much of his time and effort on helping us solve issues of concern to us
10. Our boss clearly expects high standards and a high level of accomplishment in our unit, and he helps achieve this
11. Our boss exhibits high standards of performance in ways that tend to bring out the best abilities of people in our unit.
16. When the boss makes a decision directly affecting me or my work, I know he has considered my need and interest.
21. The boss tries to get any support needed from higher-up for projects the members of our unit want to tackle.
23. When I or others in the unit propose some specific action, we know that the boss will seriously consider it.
36. The boss treats the members of our unit in a way that shows he thinks each is an important person on the team.
38. Our boss tries to get our reactions before going ahead on decisions that are important to us.



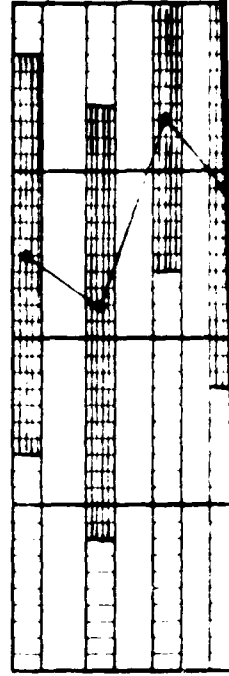
FACTOR 2 - Mutual Support

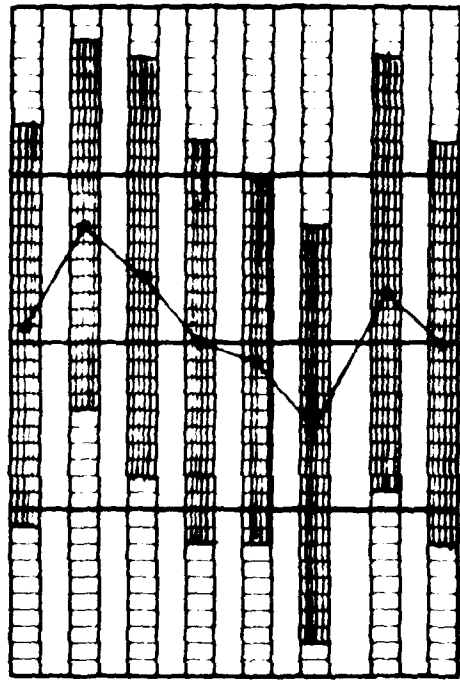
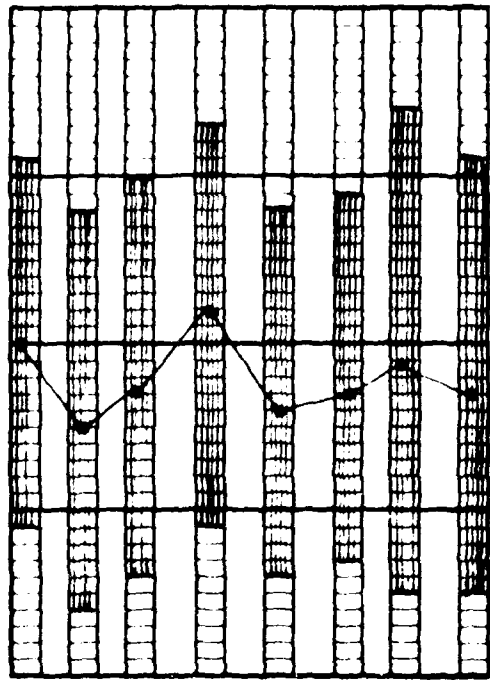
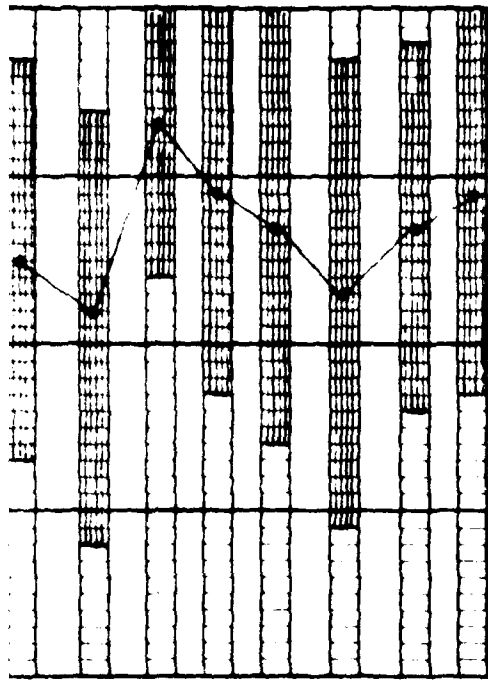
4. I can count on the members of our unit to take a constructive attitude when I need information or help.
8. Competition between people in our unit is healthy; members work for the best interests of the group rather than themselves.
14. Information flows easily among all the members in our unit; we talk openly with one another.
20. The objectives for the output of our unit are set in a way that the people accept them and have a strong interest in trying to attain them.
22. The members of our unit don't hesitate to "stick their necks out" to get work done even at the risk of making some mistakes.
28. It is the accepted practice for members of our unit to suggest proposals to aid efficiency and save costs.
34. Members of our unit work together on problems with a relationship that is free from strain.
35. Within our unit there is definite encouragement for members who try to raise output.



FACTOR 3 - Encouragement of Initiative

2. The boss likes to have his subordinates accept additional responsibility and not hesitate to act in his absence.
7. Our boss does things in a way which enables us to make as many decisions as possible without checking with him.
13. It is quite easy for me to have a talk with the boss whenever I ask.
17. I am expected to go ahead and make decisions about what to do when I am not asked.





- act in his absence
7. Our boss does things in a way which enables us to make as many decisions as possible without checking with him
 13. It is quite easy for me to have a talk with the boss whenever I ask
 17. I am expected to go ahead and make decisions about what jobs to work on and when
 24. The boss's manner makes it easy for me to tell him when things aren't going as well as he expects
 27. The boss shows he believes our unit will perform well without his having to maintain a tight rein
 31. When one of us makes a mistake, our boss is understanding and fair with us
 37. The boss leaves it up to me to decide how to tackle a job he has assigned to me

FACTOR 4 - Organization Image

3. Complaints and grievances are settled quickly at the lowest level
5. We get advanced notice on important changes that involve our unit
12. Organization plans and policy show that management understands the work and problems of our unit
15. There is a good chance that suggestions for improvement by members of our unit will get favorable action from higher-ups
26. Our discussions with the boss produce important changes we can see in the way the organization is run
30. We get the support we need from other units
33. The boss gets a group of us together from time to time to explore our thinking on current problems
39. Our unit understands where the organization is headed

FACTOR 5 - Rewards and Recognition

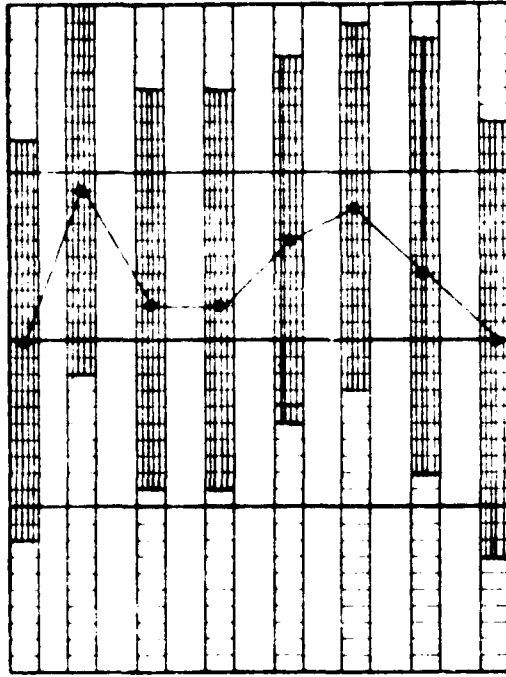
1. Schedules and forecasts of our unit's work load are reasonable
9. Discipline is handled fairly and privately in our work unit
18. Promotion and career advancement in our unit are based upon merit
19. Our organization has specific improvement objectives that our unit understands
25. Plans and programs make the best use of the experience and skills of members of my unit
29. The kinds of encouragement and rewards the boss can give in our unit for a good job keep us trying to do better
32. When output or quality is raised, we get our fair share of the credit
40. Those members of our unit who contribute the most are the ones who get rewarded the

Figure C-1: MSR 74 TOTAL SAMPLE (Stayers and Leavers) N=1 238

FACTOR 1 - Upward Influence - Downward Involvement

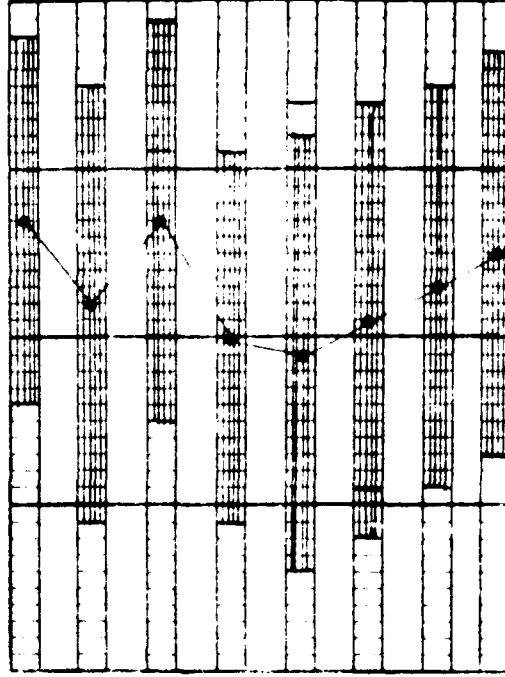
6. The boss spends much of his time and effort on helping us solve issues of concern to us.
10. Our boss clearly expects high standards and a high level of accomplishment in our unit, and he helps achieve this.
11. Our boss exhibits high standards of performance in ways that tend to bring out the best abilities of people in our unit.
16. When the boss makes a decision directly affecting me or my work, I know he has considered my need and interest.
21. The boss tries to get any support needed from higher-up for projects the members of our unit want to tackle.
23. When I or others in the unit propose some specific action, we know that the boss will seriously consider it.
36. The boss treats the members of our unit in a way that shows he thinks each is an important person on the team.
38. Our boss tries to get our reactions before going ahead on decisions that are important to us.

RARELY 1 2 3 4 5
SOMETIMES MOST OF THE TIME ALWAYS



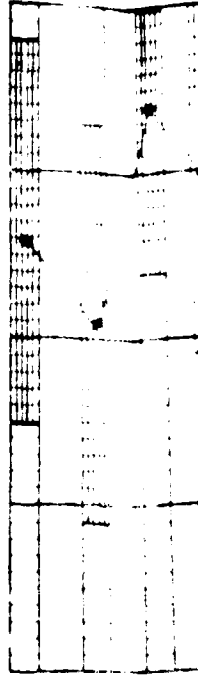
FACTOR 2 - Mutual Support

4. I can count on the members of our unit to take a constructive attitude when I need information or help.
8. Competition between people in our unit is healthy; members work for the best interests of the group rather than themselves.
14. Information flows easily among the members in our unit; we talk openly with one another.
20. The objectives for the output of our unit are set in a way that the people accept them and have a strong interest in trying to attain them.
22. The members of our unit don't hesitate to "stick their necks out" to get work done even at the risk of making some mistakes.
28. It is the accepted practice for members of our unit to suggest proposals to aid efficiency and save costs.
34. Members of our unit work together on problems with a relationship that is free from strain.
35. Within our unit there is definite encouragement for members who try to raise output.



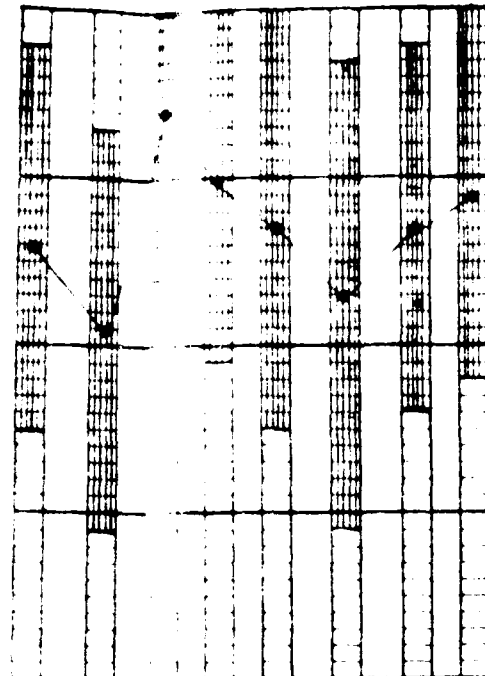
FACTOR 3 - Encouragement of Initiative

2. The boss likes to have his subordinates accept additional responsibility and to hesitate to act in his absence.
7. Our boss does things in a way which enables us to make as many decisions as possible without checking with him.
13. It is quite easy for me to have a talk with the boss whenever I ask.



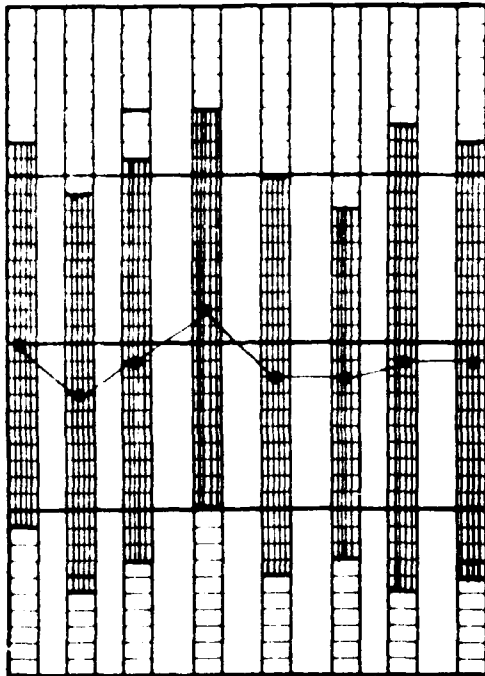
Factor 3 - Encouragement or Initiative

2. The boss likes to have his subordinates accept additional responsibilities and to act in his absence
7. Our boss does things in a way which enables us to make many decisions as well as without checking with him
13. It is quite easy for me to have a talk with the boss whenever I ask
17. I am expected to go ahead and make decisions about what jobs to work on and when
24. The boss's manner makes it easy for me to tell him when things aren't going as well as he expects
27. The boss shows he believes our unit will perform well without his having to maintain a tight rein
31. When one of us makes a mistake, our boss is understanding and fair with us
37. The boss leaves it up to me to decide how to tackle a job he has assigned to me



Factor 4 - Organization Image

3. Complaints and grievances are settled quickly at the lowest level
5. We get advanced notice on important changes that involve our unit
12. Organization plans and policy show that management understands the work and problems of our unit
15. There is a good chance that suggestions for improvement by members of our unit will get favorable action from higher-ups
26. Our discussions with the boss produce important changes we can see in the way the organization is run
30. We get the support we need from other units
33. The boss gets a group of us together from time to time to explore our thinking on current problems
39. Our unit understands where the organization is headed



Factor 5 - Rewards and Recognition

1. Schedules and forecasts of our unit's work load are reasonable
9. Discipline is handled fairly and privately in our work unit
18. Promotion and career advancement in our unit are based upon merit
19. Our organization has specific improvement objectives that our unit understands
25. Plans and programs make the best use of the experience and skills of members of my unit
29. The kinds of encouragement and rewards the boss can give in our unit for a good job keep us trying to do better
32. When output or quality is raised, we get our fair share of the credit
40. Those members of our unit who contribute the most are the ones who get rewarded the most

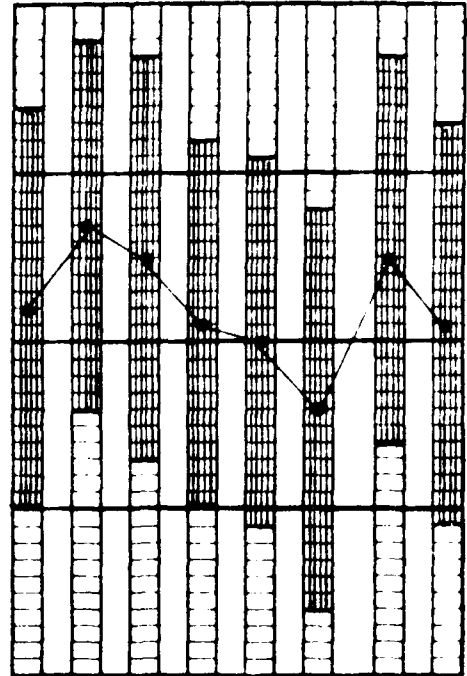
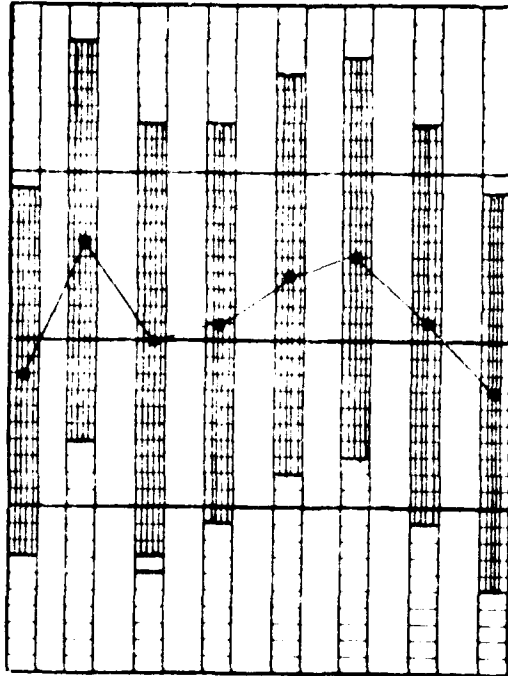


Figure C-2: MSR 74 TOTAL STAYERS -- N=665

FACTOR 1 - Upward Influence - Downward Involvement

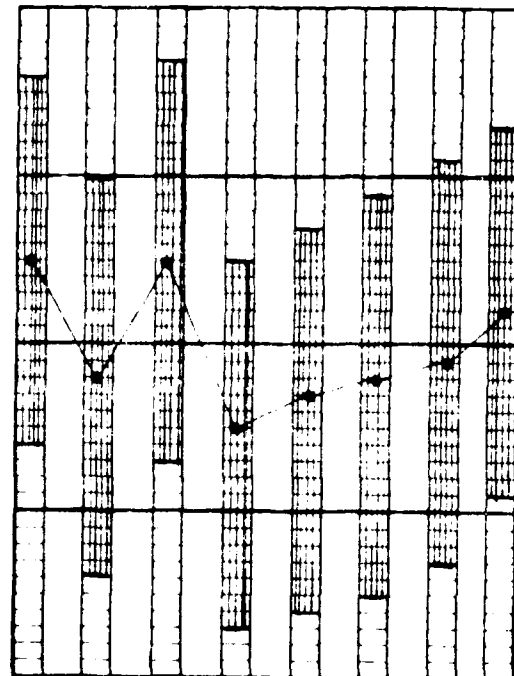
6. The boss spends much of his time and effort on helping us solve issues of concern to us.
10. Our boss clearly expects high standards and a high level of accomplishment in our unit, and he helps achieve this.
11. Our boss exhibits high standards of performance in ways that tend to bring out the best abilities of people in our unit.
16. When the boss makes a decision directly affecting me or my work, I know he has considered my need and interest.
21. The boss tries to get any support needed from higher-up for projects the members of our unit want to tackle.
23. When I or others in the unit propose some specific action, we know that the boss will seriously consider it.
36. The boss treats the members of our unit in a way that shows he thinks each is an important person on the team.
38. Our boss tries to get our reactions before going ahead on decisions that are important to us.

RARELY 1 2 3 4 5 ALMOST ALWAYS



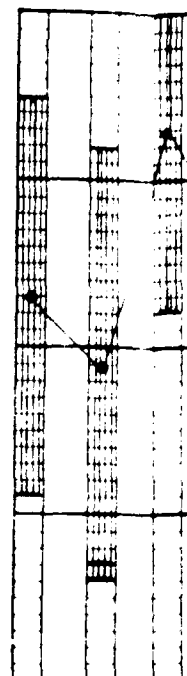
FACTOR 2 - Mutual Support

4. I can count on the members of our unit to take a constructive attitude when I need information or help.
8. Competition between people in our unit is healthy; members work for the best interests of the group rather than themselves.
14. Information flows easily among all the members in our unit, we talk openly with one another.
20. The objectives for the output of our unit are set in a way that the people accept them and have a strong interest in trying to attain them.
22. The members of our unit don't hesitate to "kick their necks out" to get work done even at the risk of making some mistakes.
28. It is the accepted practice for members of our unit to suggest proposals to aid efficiency and save costs.
34. Members of our unit work together on problems with a relationship that is free from strain.
35. Within our unit there is definite encouragement for members who try to raise output.



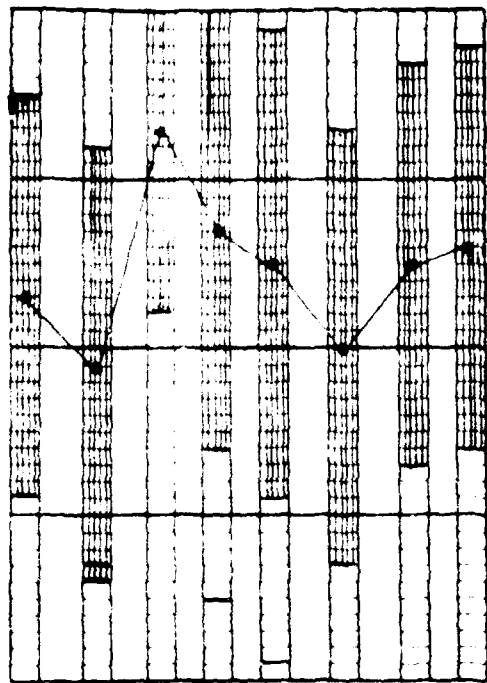
FACTOR 3 - Encouragement of Initiative

2. The boss likes to have his subordinates accept additional responsibility and not hesitate to act in his absence.
7. Our boss does things in a way which enables us to make as many decisions as possible without checking with him.
13. It is quite easy for me to have a talk with the boss whenever I ask.



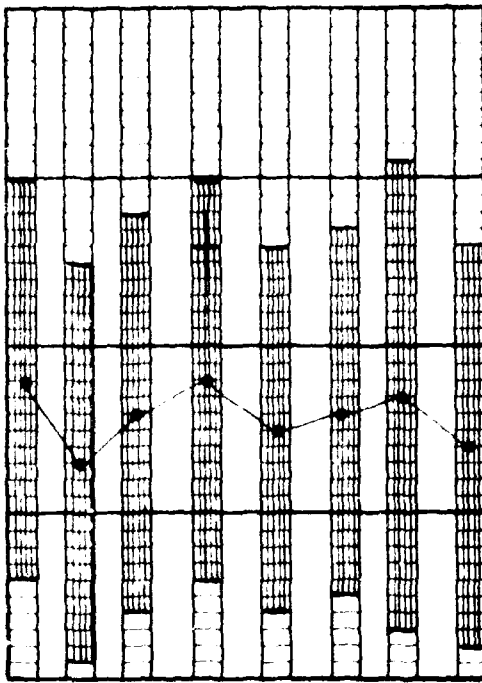
FACTOR 3 - Encouragement of Initiative

2. The boss likes to have his subordinates accept additional responsibility and not hesitate to act in his absence.
7. Our boss does things in a way which enables us to make as many decisions as possible without checking with him.
13. It is quite easy for me to have a talk with the boss whenever I ask.
17. I am expected to go ahead and make decisions about what jobs to work on and when.
24. The boss's manner makes it easy for me to tell him when things aren't going as well as he expects.
27. The boss shows he believes our unit will perform well without his having to maintain a tight rein.
31. When one of us makes a mistake, our boss is understanding and fair with us.
37. The boss leaves it up to me to decide how to tackle a job he has assigned to me.



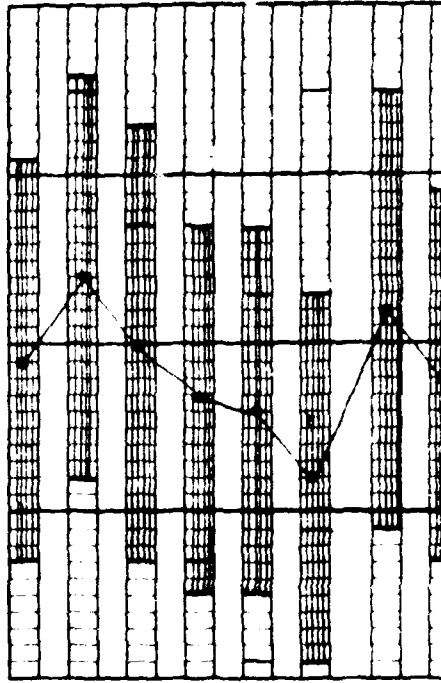
FACTOR 4 - Organization Image

3. Complaints and grievances are settled quickly at the lowest level.
5. We get advanced notice on important changes that involve our unit.
12. Organization plans and policy show that management understands the work and problems of our unit.
15. There is a good chance that suggestions for improvement by members of our unit will get favorable action from higher-ups.
26. Our discussions with the boss produce important changes we can see in the way the organization is run.
30. We get the support we need from other units.
33. The boss gets a group of us together from time to time to explore our thinking on current problems.
39. Our unit understands where the organization is headed.



FACTOR 5 - Rewards and Recognition

1. Schedules and forecasts of our unit's work load are reasonable.
9. Discipline is handled fairly and privately in our work unit.
18. Promotion and career advancement in our unit are based upon merit.
19. Our organization has specific improvement objectives that our unit understands.
25. Plans and programs make the best use of the experience and skills of members of my unit.
29. The kinds of encouragement and rewards the boss can give in our unit for a good job keep us trying to do better.
32. When output or quality is raised, we get our fair share of the credit.



ANNEX D
THE OFFICER FITNESS REPORT

D-1



Annex D

THE OFFICER FITNESS REPORT

An estimate of officer proficiency was obtained by averaging total points taken from the last three Officer Fitness Reports available on each officer in the sample. Specifically, Item 15a, "Evaluation of Overall Performance of All Duties Assigned," of the Report On the Fitness of Officers, NAVPERS 1611/1 (Rev. 12-69), BUPERINST 1611 Series, was used. This item has the form presented in Figure D-1 which permits conversion into a numerical scale with a low of zero in the adverse column and a high of eight in the outstanding performance category. Weights were assigned as shown in Figure D-1.

In January 1974, the Navy began using a new format for the Report on the Fitness of Officers (OFR). Although the form has been rearranged and some modifications have been made, Section 28, Evaluation, still remains comparable to Section 15, Performance of Duties, of the report previously used. This section on the Appraisal Work Sheet used to work up the data to be transcribed to the smooth, BuPers copy of the OFR states specifically that this is a "performance" mark. The form of the report is shown in Figure D-2. There were eight observations reported in the new format recorded for use in this study phase and no special statistical treatment was given them.

The basis for using Item 15a alone for the generation of a performance index was in part due to consideration of practicality, and reinforced by the finding of Githens, Rimland and Steinemann that the "Performance of Duties" grade

has a .98 correlation with the mean of the four Officer Fitness Report factors (performance, desirability, overall evaluation and personal attributes).^{1/}

Officer Fitness Reports marked "Under Instruction" were not used, except for the operational training of nuclear submarine officers on a prototype plant. This duplicated the operational experience sufficiently to warrant inclusion in the average.

Footnotes

- 1/ W.H. Githens, B. Rimland and J.H. Steineman, The Effects of Correcting Early Fitness Reports For Situational Factors. San Diego: U.S. Naval Personnel Research Activity, November 1965, (Research Report SRR66-7) cited in W.H. Githens, N. H. Abrahams and I. Neuman, Source Warfare Specialty and Tenure of High Quality Line Officers. San Diego: U.S. Naval Personnel Research Activity, June 1968, p. 3. (Research Report SRR68-22).

ANNEX E

RESULTS OF A STUDY OF THE MSR 1973 SAMPLE

E-1



Annex E

RESULTS OF A STUDY OF THE MSR 1973 SAMPLE

A. Most Representative Measure of Officer Proficiency

Table E-1 presents the descriptive statistics on the performance proficiency distributions of young officers electing to stay in the Navy during the 3rd and 4th quarters 1973 by the Source Groups under consideration in this study. Again, all performance rating distributions are negatively skewed. Differences in measures of central tendency and variance between Source Groups are, by inspection, negligible.

Pearson correlation coefficients were calculated between combinations of the first, second and third Officer Fitness Reports and the Average of the three Fitness Reports (AFR). Table E-2 presents these correlation coefficients all of which are positive and significantly different from zero at the .001 level of confidence. These interrelationships between measures of proficiency on each officer, accomplished at different times, provide information on which to base the selection decision to use the Average of the last three Fitness Reports as the most representative measure of officer proficiency for this study. Additional information in terms of correlations between officer proficiency measures and perceived unit organizational climate is provided in the next section.

	<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Standard Deviation</u>	<u>Variance</u>	<u>Range</u>	<u>Number</u>
Overall Sample Performance Index	7.086	7.137	7.000	0.733	0.538	3.3-8.0	563
U.S.Naval Academy	7.081	7.139	7.000	0.770	0.593	3.3-8.0	230
NROTC	6.975	7.017	7.000	0.761	0.579	3.6-8.0	186
OCS/AOC	7.233	7.295	8.000	0.608	0.369	5.3-8.0	147

First OFR							
U.S.Naval Academy	7.212	7.398	8.000	0.988	0.977	0.0-8.0	230
NROTC	7.199	7.265	7.000	0.804	0.647	4.0-8.0	186
OCS/AOC	7.422	-	8.000	0.692	0.478	6.0-8.0	147

Second OFR							
U.S.Naval Academy	7.091	7.188	7.000	0.926	0.857	2.0-8.0	230
NROTC	7.011	7.109	7.000	0.953	0.908	2.0-8.0	186
OCS/AOC	7.259	7.364	8.000	0.777	0.604	5.0-8.0	147

Third OFR							
U.S.Naval Academy	7.013	7.092	7.000	0.967	0.935	0.0-8.0	230
NROTC	6.806	6.930	7.000	1.083	1.173	0.0-8.0	186
OCS/AOC	7.102	7.151	7.000	0.809	0.654	4.0-8.0	147

Table E-1: DESCRIPTIVE STATISTICS ON PERFORMANCE
INDEX AND SEPARATE OFFICER FITNESS
REPORT DISTRIBUTIONS BY SOURCE GROUP

	<u>Second OFR</u>	<u>Third OFR</u>	<u>AFR</u>
First OFR	0.552 Sig.=.001	0.293 Sig.=.001	0.753 Sig.=.001
Second OFR		0.499 Sig.=.001	0.853 Sig.=.001
Third OFR			0.771 Sig.=.001

Table E-2: PEARSON CORRELATION COEFFICIENTS
FOR VARIOUS COMBINATIONS OF OFFICER FITNESS
REPORTS. N=563 OFFICERS ELECTING TO STAY IN
THE NAVY DURING 3RD & 4TH QUARTERS, 1973

B. Perception of Organizational Climate

An estimate of each participating officer's perception of his organizational climate was obtained with the Organizational Climate Audit (OCA) instrument discussed in Chapter III. A total OCA score for each officer in the sample was calculated by adding the numerical equivalents (1 through 5) of his/her responses to each of the forty OCA questions. The lowest possible score is forty and the maximum possible score is two hundred. The minimum score obtained is fifty-seven and the maximum is one hundred ninety-two. Completed OCA's which revealed a single response category marked for all forty questions were eliminated from the sample.

A singular requirement for adequacy of any predictor variable is that it have variability. It is reasonable to assume that Navy unit organizational climates differ and that

measures of these different unit organizational climates will vary widely within the range of the measure. Lack of variability in obtained measures of organizational climate may be due to one or a combination of known and unknown factors such as a deficient instrument, e.g., OCA, no real unit organization climate differences and biased observers not equally balanced in the sample.

Figure E-3 presents a frequency polygon for the distribution of OCA total scores on the full sample of officers electing to stay in the Navy during the 3rd and 4th quarters of FY 1973. The distribution shown has a mean of 130.90 and a standard deviation of 30.99. Clearly, this measure of unit organizational climate has variability. However, the distribution is somewhat flat and slightly negatively skewed.

OCA total scores were divided into eleven groups each approximately one half standard deviation in length with a minimum expected frequency of 9.6. A Chi Square statistic of 46.1 on 8 degrees of freedom resulted. This leads to rejection of normality at the .005 level when compared with Chi Square of 21.96 required at the .005 level with 8 degrees of freedom.

1. Perceptions of Organizational Climate By Source

Table E-4 presents the descriptive statistics on the OCA total score distributions of young officers electing to stay in the Navy during the 3rd and 4th quarters, 1973 by the Source Groups under consideration in the study.

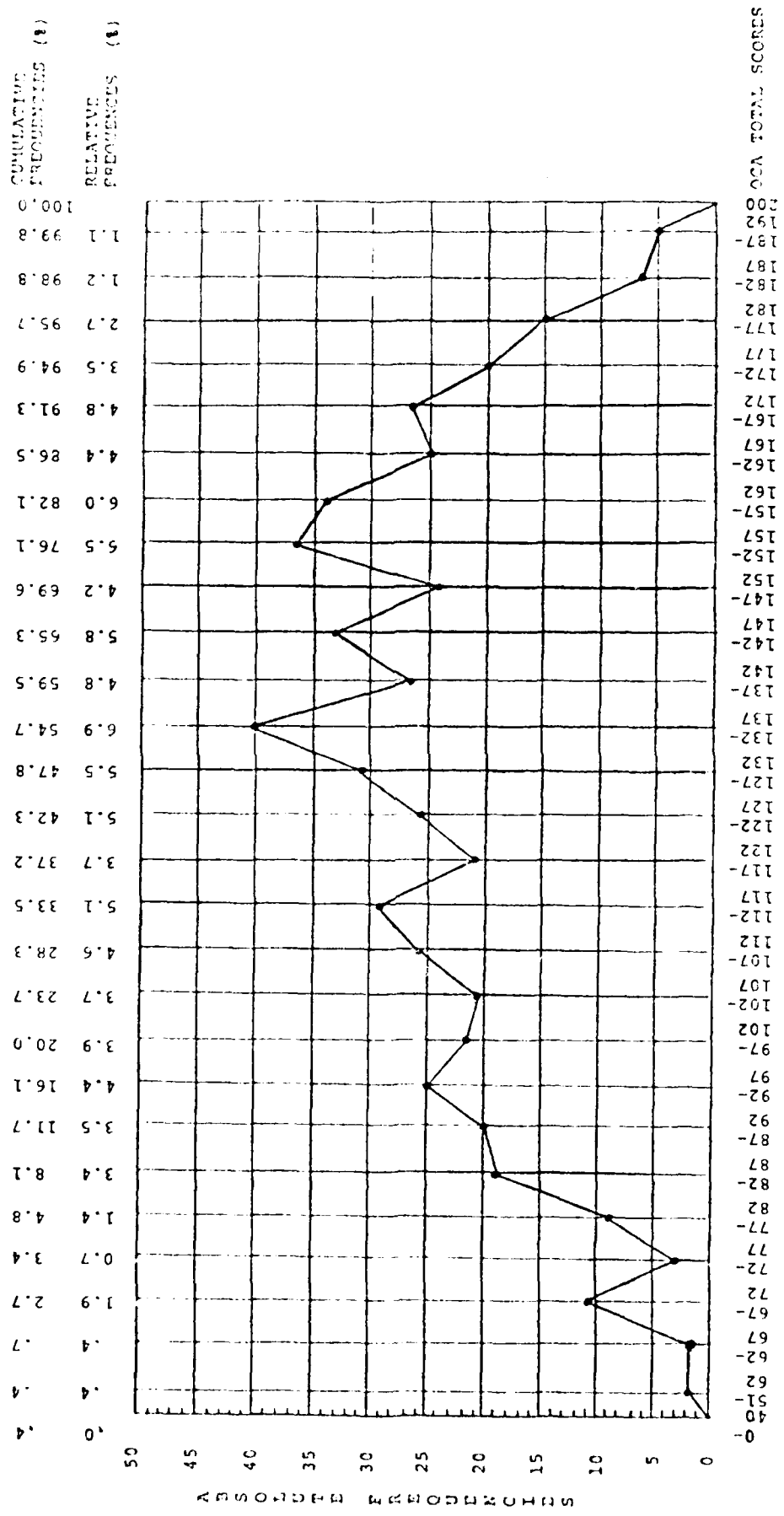


Figure E-3: A FREQUENCY POLYGON FOR THE DISTRIBUTION OF OCA TOTAL SCORES OF OFFICERS ELECTING TO STAY IN THE NAVY DURING 3RD AND 4TH QUARTERS, FY 1973

	<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Standard Deviation</u>	<u>Variance</u>	<u>Range</u>	<u>Number</u>
<u>Overall Sample</u>							
OCA Total Score	132.24	134.10	155.00	30.17	910.46	58-198	564
U.S. Naval Academy	130.90	133.50	115.00	30.99	960.41	58-191	230
NROTC	131.230	133.33	160.00	30.141	908.46	59-198	187
OCS/AOC	135.64	136.25	153.00	28.83	831.340	63-189	147

Table E-4: DESCRIPTIVE STATISTICS ON ORGANIZATIONAL
CLIMATE AUDIT SCORE DISTRIBUTIONS BY SOURCE GROUP

In order to examine the variable OCA Total Score more fully, an Analysis of Variance (ANOVA) was run using it as the dependent variable and source (USNA, AOC/OCS, NROTC) and designator (surface, sub, air) as independent variables and including interaction. None of the effects (source, designator or interaction) was found to be significant at the .1 level of significance.

An analysis of Co-Variance (ANACOVA) was run with the same variables but with AFR as a covariate. The effects of source designator and their interaction were not significant at the .1 level. The covariate effect was, however, significant at the .005 level.

C. Relationships Between Performance Proficiency and Organizational Climate Perception

Pearson correlation coefficients were computed between performance proficiency measures and organizational climate perception measures. Table E-5 presents these correlation coefficients. All correlations are positive and significantly different from zero at the .001 level of confidence. The average of the three officer fitness reports is more highly correlated with the OCA total score than any of the separate fitness report performance measures.

	OCA
	Total Score
AFR	.170 Sig.=.001
FIT-1	.143 Sig.=.001
FIT-2	.109 Sig.=.001
FIT-3	.151 Sig.=.001

Table E-5: PEARSON CORRELATION COEFFICIENTS
BETWEEN OFFICER PERFORMANCE MEASURES
AND PERCEIVED ORGANIZATIONAL CLIMATE N=564

The average of the three Officer Fitness Reports (AFR) was used in Pearson correlation coefficients calculation with OCA total score and each of the five factor scores of the OCA. Factor scores are the sums of the numerical responses to the eight questions grouped under these separate dimensions of organizational climate. Table E-6 presents these correlation coefficients. All correlations are positive and significantly different from zero at the .001 level of confidence. Clearly, OCA factor scores are highly intercorrelated. The AFR correlates slightly higher with OCA Factor 4 than with the OCA total scores.

ORGANIZATIONAL CLIMATE AUDIT						
	<u>Total Score</u>	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>	<u>Factor 4</u>	<u>Factor 5</u>
AFR	.170	.140	.152	.150	.111	.190
OCA Total Score		.906	.900	.842	.834	.896
FACTOR 1			.760	.643	.774	.750
FACTOR 2				.770	.572	.723
FACTOR 3					.612	.621
FACTOR 4						.814

Table E-6: PEARSON CORRELATION COEFFICIENTS FOR MEASURES OF ORGANIZATIONAL CLIMATE PERCEPTION AND THE PERFORMANCE MEASURE.

Because of the negatively skewed distribution of the Average Fitness Report measure of officer proficiency, and

the lack of normality in the OCA total score distribution, assumptions underlying a parametric statistical correlation method such as the Pearson are suspect. A non parametric Chi Squared test of independence technique was selected to investigate the relationship between officer proficiency measures and perceived organizational climate. Table E-7 presents OCA total scores divided into eleven categories and AFR divided at the median into average proficiency measures below seven and those seven and above. When the expected frequency and the obtained frequency of OCA scores distribution over the eleven categories for officers with proficiency measures below seven is compared to the OCA scores for officers with proficiency measures of seven and above by means of a Chi Square statistic, the resulting Chi Square of 15,663 with 8 degrees of freedom is statistically significant at the .047 level of confidence. In other words, there is reason to believe the distribution of OCA total scores for officers with AFR's below seven is different from the distribution of OCA total scores for officers with an AFR of seven and above.

Table E-8 presents another non parametric view of the relationship between proficiency and organizational climate perception. Again, a Chi Square statistic was calculated between the actual and expected probabilities of OCA total scores below and above the median (134.1) for officers with Average Fitness Reports (AFR) below seven and seven and above. The resulting Chi Square of 5.441 with 1 degree of freedom is statistically significant at the .019 level of confidence indicating that there is reason to believe that the below seven and seven and above OCA distributions are not the same.

ORGANIZATIONAL CLIMATE AUDIT TOTAL SCORE INTERVALS									
55-82 83-96 97-110 111-124 125-138 139-152 153-166 167-180 181-208									
1. 2. 3. 4. 5. 6. 7. 8. 9.									
ROW TOTAL									
AVERAGE FITNESS REPORT									
BELOW SEVEN									
COUNT	13	24	25	24	23	21	22	19	2
ROW PCT	7.5	13.9	14.5	13.9	13.3	12.1	12.7	11.0	1.2
COL PCT	48.1	42.1	36.2	33.3	25.8	27.3	24.4	30.6	10.0
TOT PCT	2.3	4.1	4.4	4.3	4.1	3.7	3.7	3.4	0.4
SEVEN AND ABOVE									
COUNT	14	33	44	48	66	56	68	43	18
ROW PCT	3.6	8.5	11.3	12.3	16.9	14.4	17.4	11.0	4.6
COL PCT	51.9	57.9	63.8	66.7	74.2	72.7	75.6	69.4	90.0
TOT PCT	2.5	5.9	7.8	8.5	11.7	9.9	12.1	7.6	3.2
COUNT	27	57	69	72	89	77	90	62	20
TOT COL %	4.8	10.1	12.3	12.8	15.8	13.7	16.0	11.0	3.6
N=173 30.7%									
N=390 69.3%									
N=563 100.8%									
Chi Square = 15.66327 with 8 Degrees of Freedom Significance = 0.0475									

Table E-7: RELATIONSHIP BETWEEN TWO DISTRIBUTIONS OF OCA
TOTAL SCORES FOR OFFICERS WITH AVERAGE FITNESS
REPORTS BELOW SEVEN AND SEVEN AND ABOVE

ORGANIZATIONAL CLIMATE
AUDIT TOTAL SCORES

		BELOW MEDIAN 1.	ABOVE MEDIAN 2.	ROW TOTAL	
AVERAGE FITNESS REPORT					
BELOW SEVEN	COUNT	99	74	N=173	
	ROW PCT	57.2	42.8	30.7%	
	COL PCT	35.5	26.1		
	TOT PCT	17.6	13.1		
SEVEN AND ABOVE	COUNT	180	210	N=390	
	ROW PCT	46.2	53.8	69.3%	
	COL PCT	64.5	73.9		
	TOT PCT	32.0	37.3		
		COUNT	279	N=563	
		TOT COL %	49.6	50.4	100.%

Corrected Chi Square = 5.44191 With 1 Degree of
Freedom Significance = 0.0197

Table E-8: RELATIONSHIP BETWEEN THE NUMBER OF
OCA TOTAL SCORES FOR OFFICERS WITH AVERAGE
FITNESS REPORTS BELOW SEVEN AND THOSE WITH
AVERAGE FITNESS REPORTS OF SEVEN AND ABOVE.

ANNEX F

RESULTS OF A STUDY OF THE MSR 1974 SAMPLE

F-1



Annex F

RESULTS OF A STUDY OF THE MSR 1974 SAMPLE

A. Formation of the Study Data

A listing of the names of the officers meeting the sample criteria was obtained from the BuPers Officer Master File. The total number of officers in MSR group 74 meeting the study criteria was used for the sample. A total of 1,525 questionnaires were sent out with 1,317 responses received, a return percentage of 86 percent. The following table shows the return by MSR quarter:

<u>OCA MAIL-OUT/RESPONSE</u>			
<u>Quarter</u>	<u>Out</u>	<u>In</u>	<u>%</u>
1	195	176	91
2	205	184	89
3	194	165	85
4	931	792	85
Total	1,525	1,317	86

Table F-1: SURVEY MAIL-OUT/RESPONSE
PERCENTAGE BY MSR QUARTER
FY 1974

Additional shrinkage of the sample size was experienced in matching the respondents and the performance records. This shrinkage is accounted for by early losses, obliterated codes and marred OCA's, unavailability for official reasons of performance records, non-matchable records, e.g., incorrect designator or Social Security Number, and line warfare community losses occurring after the study commenced. This shrinkage is shown below:

FY 1974 MSR SAMPLE SHRINKAGE

- 1,542 - number of officers meeting sample selection criteria
- 1,525 - number of addresses of mailouts (after subtracting 17 pre-survey losses)
- 1,317 - number of survey respondents
- 1,238 - number in sample (matched OCA's and OFR's).

The composition of the sample by source and designator is shown in Table F-2.

<div>DESIG. \ SOURCE</div>	NAV ACAD (01)	NROTC(R) (04)	AOC/OCS (03) (06)	TOTAL
110X/111X	214	271	110	595
112X	52	57	29	138
131X	106	123	276	505
TOTAL	372	451	415	1,238

Table F-2: STUDY SAMPLE COMPOSITION BY
SOURCE AND DESIGNATOR

As mentioned in Chapter III, the sample from each MSR group was divided into Experimental and Holdout groups as shown subsequently in Tables F-13 and F-14. Further, although some of the numbers of officers in the cells of the source/designator matrix became quite small, the resulting sub-sample sizes were sufficiently large to permit the employment of a variety of statistical techniques.

B. Officer Proficiency

An estimate of officer proficiency was obtained by averaging total points taken from the last three Officer

Fitness Reports available on each officer in the sample. Specifically, Item 15a, "Evaluation of Overall Performance of All Duties Assigned," of the Report On the Fitness of Officers, NAVPERS 1611/1 (Rev. 12-69), BUPERINST 1611 Series, was used. This item has the form presented in Figure F-1 which permits conversion into a numerical scale with a low of zero in the adverse column and a high of eight in the outstanding performance category. Weights were assigned as shown in Figure F-1.

In January 1974, the Navy began using a new format for the Report on the Fitness of Officers (OFR). Although the form has been rearranged and some modifications have been made, Section 28, Evaluation, still remains comparable to Section 15, Performance of Duties, of the report previously used. This section on the Appraisal Work Sheet used to work up the data to be transcribed to the smooth, BuPers copy of the OFR states specifically that this is a "performance" mark. The form of the report is shown in Figure F-2. There were eight observations reported in the new format recorded for use in this study phase and no special statistical treatment was given them.

The basis for using Item 15a alone for the generation of a performance index was in part due to consideration of practicality, and reinforced by the finding of Githens, Rimland and Steinemann that the "Performance of Duties" grade has a .98 correlation with the mean of the four Officer Fitness Report factors (performance, desirability, overall evaluation and personal attributes).^{1/}

Officer Fitness Reports marked "Under Instruction" were not used, except for the operational training of nuclear submarine officers on a prototype plant. This duplicated the operational experience sufficiently to warrant inclusion in the average.

15. PERFORMANCE OF DUTIES: (Indicate evaluation by "X" in appropriate marking column for each item and provide supporting comments in Section 21.)									
(Details of duties noted in Section 11)	NO OR S. ON NON	Outstanding performance.	Excellent performance. Frequently demonstrates outstanding performance.	Very good performance. Demonstrates excellent performance.		Satisfactory performance. Basically qualified.	Inadequate performance. He is not qualified. (Adverse)		
				6	5			4	3
(a) Evaluation of overall performance of all duties assigned.	8	7				2	1	0	

Figure F-1: Form of Item 15, "Evaluation of Overall Performance Of All Duties Assigned", Officer Fitness Report.

For MSR 74, there were 1,238 OFR's subjected to analysis of which 965 corresponded to stayers and 273 corresponded to leavers as of 30 June 1974 (end FY 74) cutoff on data collection. A frequency polygon showing the distribution of the performance index (average of weighted marks in Item 15 or 28 in last three OFR's) for those officers in the total sample, 1,238, is presented in Figure F-3. For the sake of visual comparison, the frequency polygon derived from the MSR 73 data is shown in the same figure. The descriptive statistics for each of these distributions is shown in Table F-3.

	MEAN	MEDIAN	MODE	S.D.	VARIANCE	RANGE
1973	7.086	7.137	7.0	0.730	0.533	3.3-8.0
1974	7.062	7.144	7.0	0.785	0.616	2.3-8.0
Performance Index=Average of Three OFR's						

Table F-3: DESCRIPTIVE STATISTICS ON OFFICER PERFORMANCE INDICES FOR TOTAL SAMPLE OF MSR 73 AND MSR 74

Tests of significance of the differences measured by these data on AFR and on OCAT scores described in the next section are presented later in this annex with a discussion of the usefulness of each of these measures as a predictor of staying.

As previously reported in the case of the MSR 73 group, an examination of the MSR 74 performance statistics reveals a distribution that is distinctly negatively skewed. These two polygons have generally the same shape. Further, for both populations, continuous screening of the officers from pre-selection through commissioning to this career decision point creates a group whose performance marks tend strongly to the high side of the scale.

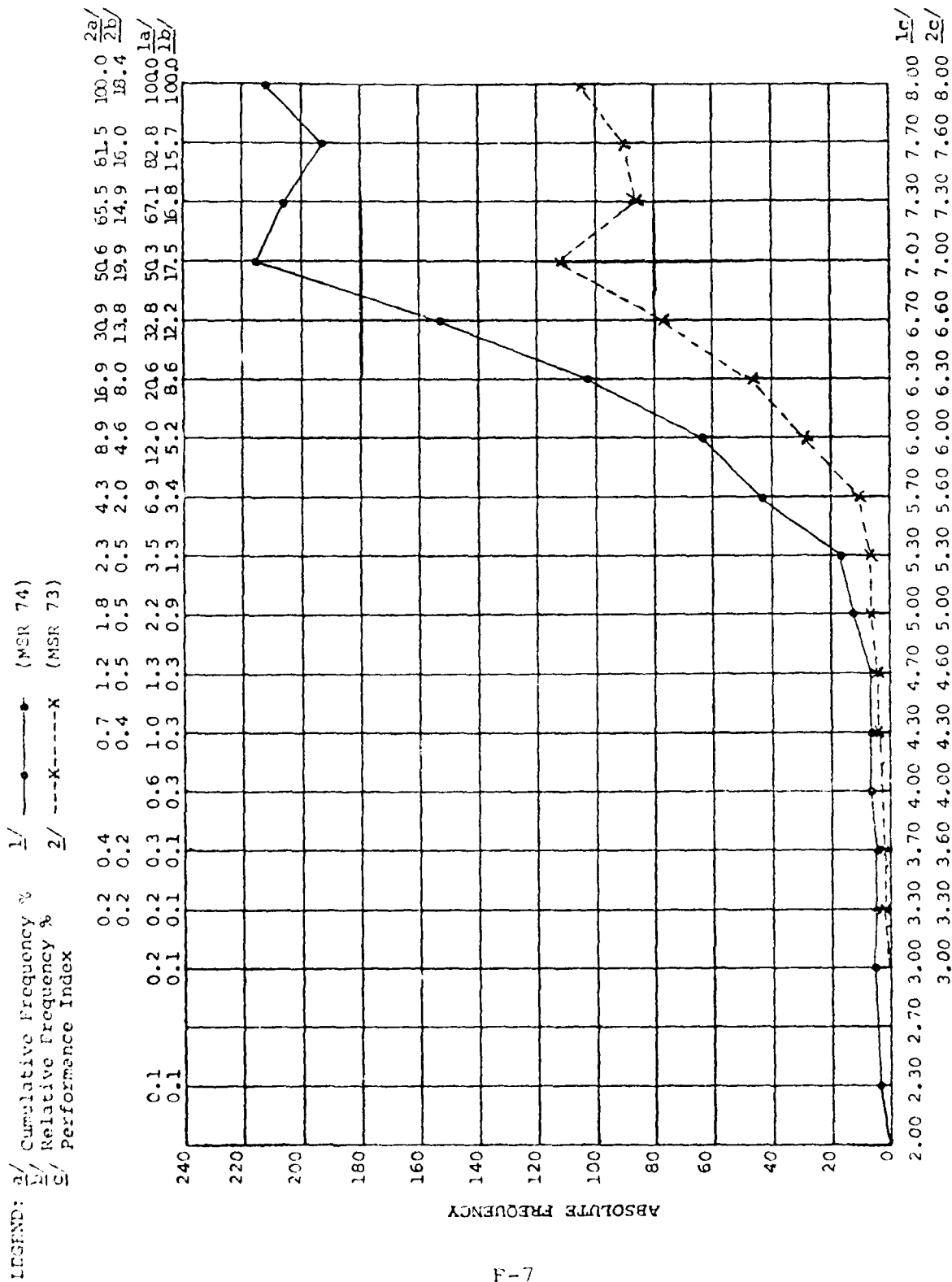


Figure F-3: OFFICER PERFORMANCE INDEX FREQUENCY DISTRIBUTION FOR
 TOTAL SAMPLE--STAYERS & LEAVERS (MSR 74--N=1,238) 1/
 OFFICER PERFORMANCE INDEX FREQUENCY DISTRIBUTION FOR
 TOTAL SAMPLE (MSR 73--N=563) 2/

Frequency polygons showing the distributions of the relative frequencies of the performance indices for total sample, stayers and leavers in MSR 74 are presented in Figure F-4. The curves are similar, but by inspection it can be seen that the curve of the leavers shows relatively larger numbers of individuals whose AFR indices are lower. The descriptive statistics of these distributions are contained in Table F-4.

	MEAN	MEDIAN	MODE	S.D.	VARIANCE	RANGE
TOTAL	7.062	7.144	7.0	0.785	0.616	2.3-8.0
STAYER	7.124	7.216	7.3	0.742	0.550	2.3-8.0
LEAVER	6.842	6.958	7.0	0.886	0.785	3.0-8.0

Table F-4: DESCRIPTIVE STATISTICS ON OFFICER PERFORMANCE INDICES BY TOTAL, STAYER AND LEAVER, MSR 1974

C. Perception of Organizational Climate

A quantified description of the unit organizational climate perceived by each officer in the sample was obtained with the Organizational Climate Audit (OCA), a forty question survey instrument. A total score for each officer was calculated by summing the numerical equivalents ranging from one through five for each of the forty survey items. The minimum score, therefore, is 40, the maximum is 200. There were no OCA's returned with either a maximum or minimum possible score marked. The range was from a low of 53 to a high of 198. There were no OCA's which had a single response category marked. As previously noted, 1,317 responses (86%) were received from the survey. Of this number, only 1,238 were ultimately usable in the data analysis. The explanation of the shrinkage appeared earlier in this annex.

Frequency polygons of the distribution of Organizational Climate Audit Total (OCAT) scores for all officers in the MSR 74 group, scores for STAYERS and for LEAVERS are shown in

AFR RELATIVE FREQUENCY (PER CENT)

LEGEND:
 Total - - - - -X
 Stayers - - - - -●
 Leavers - - - - -▲

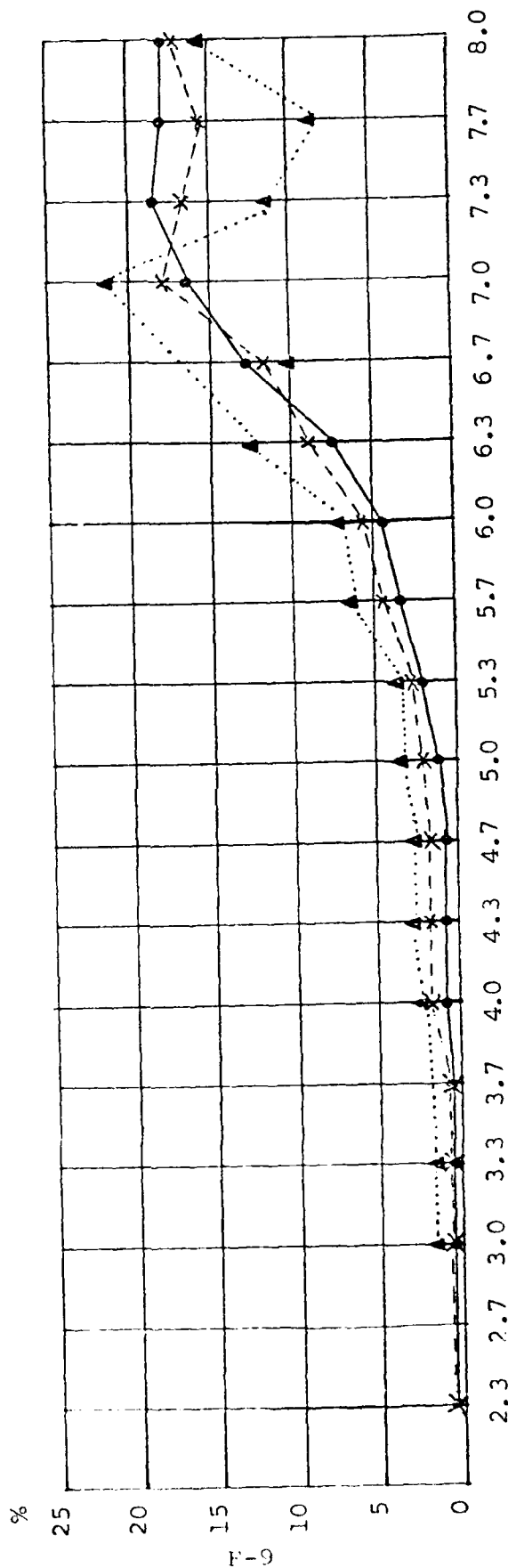


Figure F-4: RELATIVE FREQUENCIES OF PERFORMANCE INDICES
 OF TOTAL SAMPLE--STAYERS AND LEAVERS (MSR-74)

Figure F-5. Descriptive statistics for each of these distributions are contained in Table F-5. A more extensive set of descriptive statistics for the total sample broken down by designator and source and for stayer and leaver within designator and source was shown in the original report.

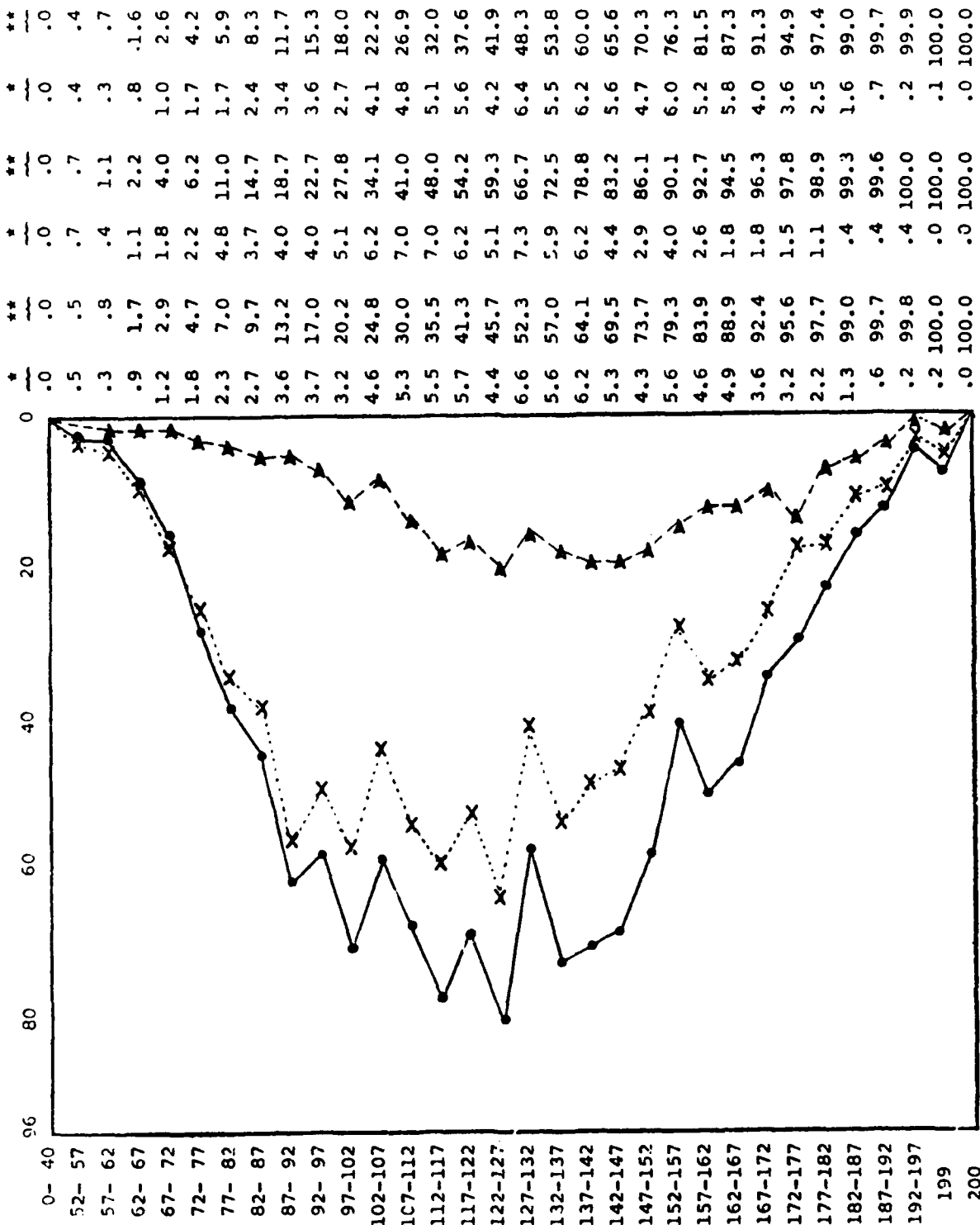
OCA TOTAL SCORE							
	MEAN	MEDIAN	MODE	S.D.	VARIANCE	RANGE	N
TOTAL SAMPLE	129.560	130.500	120	30.311.	918.757	55-198	1,238
STAYER	132.280	133.938	120	30.273	916.454	55-198	965
LEAVER	119.945	119.857	117	28.484	811.338	56-198	273

Table F-5: DESCRIPTIVE STATISTICS ON ORGANIZATIONAL CLIMATE AUDIT SCORES BY TOTAL SAMPLE, STAYERS AND LEAVERS

D. Tests of Significance

The question of whether or not statistically significant differences exist between stayers and leavers was considered by performing statistical tests of a hypothesis. Although the testing techniques were the same, a separate set of tests was performed on the data from MSR 73 and MSR 74; consequently, separate test results were obtained for each year. The primary reason for this is the difference in elapsed time from the present to each of the MSR cut-off dates (end of fiscal year). Both one tail t-tests and three-way ANOVAs were performed on the MSR 73 and 74 data. The data for MSR 73 was considered in more detail since it was used to investigate the various analytical techniques for use in the predictor model development. As a result, more t-tests and ANOVAs included in this report relate to MSR 73 and its Experimental and Holdout groups than to MSR 74.

ABSOLUTE FREQUENCIES



* Relative Frequency %
 ** Cumulative Frequency %

TOTAL SAMPLE N=1,238	LEAVERS N=273	STAYERS N=965
----	----X.....

Figure F-5: FREQUENCY POLYGON FOR DISTRIBUTION OF
 OCA TOTAL SCORES FOR TOTAL SAMPLE,
 LEAVERS AND STAYERS -- MSR 1974

One tail t-tests were performed on the entire MSR 73 and 74 groups as well as the Experimental and Holdout groups of MSR 73, on AFR, OCAT, the five factor scores and the individual OCA item scores selected for each predictor model. The null hypothesis tested was that the mean STAYER value of the selected variable was less than or equal to the mean LEAVER value against the alternative hypothesis that the mean STAYER value is larger than the mean LEAVER value. Representative tabulations of these tests are shown in Tables F-6 through F-9. The complete set of the (nonindependent) test results and their explanation are contained in the original report; however, there are several points which should be emphasized here. |

Test results represented by .000 indicate that the relationship tested could not have occurred by chance.

- The null hypothesis was rejected at the .05 significance level on all variables tested for the total samples of each MSR group.
- With MSR 73 divided into Experimental and Holdout groups, only for OCA Factor 4 did the level of significance fall below .05 and here the significance level was .06.
- With the exception of SUBMARINERS on AFR, DESIGNATOR was the dominant class of subgroups in which most of the variables showed significance at the .10 level. (The ten percent level of significance or better was chosen as an area of potential for a predictor.)

The level of significance was chosen as ten percent in order to aid in the detection of areas of considerable potential for the action of a predictor.

Possibly as a result of small numbers in the subgroup, the SUBMARINE DESIGNATOR in MSR 73 showed no significance in

DEPENDENT VARIABLES

	<u>AFR</u>	<u>OCAT</u>	<u>FACTOR 1</u>	<u>FACTOR 2</u>	<u>FACTOR 3</u>	<u>FACTOR 4</u>	<u>FACTOR 5</u>
TOTAL	.000	.000	.000	.000	.000	.000	.000
USNA	.216	.335	.756	.135	.106	.692	.271
NROTC	.224	.075	.164	.127	.321	.013	.045
AOC/OCS	.000	.000	.000	.000	.000	.000	.000
SURFACE	.004	.001	.004	.002	.021	.000	.003
SUBMARINE	.023	.006	.060	.003	.011	.059	.002
AIR	.000	.000	.002	.000	.000	.000	.000
USNA-SURFACE	.564	.544	.880	.220	.602	.630	.274
USNA-SUBMARINE	.064	.049	.097	.061	.022	.295	.026
USNA-AIR	.582	.750	.900	.572	.463	.783	.777
NROTC-SURFACE	.237	.306	.358	.384	.358	.226	.305
NROTC-SUBMARINE	.279	.465	.515	.439	.520	.451	.192
NROTC-AIR	.655	.059	.154	.091	.367	.004	.032
AOC-OCS-SURFACE	.028	.007	.011	.008	.083	.002	.028
AOC-OCS-SUBMARINE	.366	.050	.146	.101	.013	.393	.020
AOC-OCS-AIR	.000	.000	.005	.000	.003	.000	.000

Table F-6: SIGNIFICANCE LEVELS OF t-TESTS* STAYERS VS LEAVERS
 (* OF $H_0: \mu_S = \mu_L$ AGAINST $H_1: \mu_S > \mu_L$)

1974 GROUP

DEPENDENT VARIABLES

	<u>AFR</u>	<u>OCAT</u>	<u>FACTOR 1</u>	<u>FACTOR 2</u>	<u>FACTOR 3</u>	<u>FACTOR 4</u>	<u>FACTOR 5</u>
TOTAL	.000	.000	.000	.000	.003	.000	.000
USNA	.000	.000	.001	.002	.038	.001	.000
NROTC	.596	.002	.002	.000	.019	.030	.008
AOC/OCS	.044	.170	.386	.208	.156	.192	.104
SURFACE	.002	.012	.009	.009	.095	.036	.015
SUBMARINE	.504	.007	.084	.002	.087	.016	.003
AIR	.003	.001	.001	.005	.011	.005	.001
USNA-SURFACE	.001	.282	.235	.253	.512	.262	.265
USNA-SUBMARINE	.170	.000	.001	.000	.020	.000	.000
USNA-AIR	.002	.039	.019	.236	.133	.097	.006
NROTC-SURFACE	.427	.007	.018	.005	.032	.026	.015
NROTC-SUBMARINE	.930	.738	.799	.620	.668	.752	.613
NROTC-AIR	.315	.005	.002	.003	.023	.043	.064
AOC-OCS-SURFACE	.213	.239	.138	.334	.292	.349	.234
AOC-OCS-SUBMARINE	.239	.952	.988	.827	.784	.896	.894
AOC-OCS-AIR	.220	.212	.507	.263	.338	.113	.080

Table F-7: SIGNIFICANCE LEVELS OF t-TESTS* STAYERS VS LEAVERS
 (* OF $H_0: \mu_S \leq \mu_L$ AGAINST $H_1: \mu_S > \mu_L$)
 1973 GROUP
 (One Tail Tests)

DEPENDENT VARIABLES

	<u>AFR</u>	<u>OCAT</u>	<u>FACTOR 1</u>	<u>FACTOR 2</u>	<u>FACTOR 3</u>	<u>FACTOR 4</u>	<u>FACTOR 5</u>
TOTAL	.000	.005	.002	.013	.056	.060	.004
USNA	.008	.154	.122	.170	.384	.194	.125
NROTC	.028	.010	.001	.021	.055	.114	.021
AOC/OCS	.052	.142	.303	.175	.133	.243	.066
SURFACE	.001	.035	.032	.034	.088	.080	.051
SUBMARINE	.834	.284	.345	.115	.688	.485	.095
AIR	.007	.026	.006	.140	.060	.112	.043
USNA-SURFACE	.021	.500	.527	.360	.593	.397	.593
USNA-SUBMARINE	.731	.042	.116	.012	.305	.098	.030
USNA-AIR	.045	.313	.119	.697	.358	.420	.274
NROTC-SURFACE	.088	.024	.014	.084	.040	.070	.021
NROTC-SUBMARINE	.714	.692	.504	.697	.717	.768	.574
NROTC-AIR	.024	.020	.002	.016	.085	.179	.135
AOC-OCS-SURFACE	.035	.137	.102	.143	.111	.311	.180
AOC-OCS-SUBMARINE	.571	.897	.956	.760	.911	.892	.704
AOC-OCS-AIR	.384	.224	.435	.409	.176	.173	.111

Table F-8: SIGNIFICANCE LEVELS OF t-TESTS* STAYERS VS LEAVERS
 (* OF $H_0: \mu_S \leq \mu_L$ AGAINST $H_1: \mu_S > \mu_L$)
 1973 EXPERIMENTAL GROUP
 (One Tail Tests)

DEPENDENT VARIABLES

	<u>AFR</u>	<u>OCAT</u>	<u>FACTOR 1</u>	<u>FACTOR 2</u>	<u>FACTOR 3</u>	<u>FACTOR 4</u>	<u>FACTOR 5</u>
TOTAL	.051	.000	.002	.000	.006	.000	.000
USNA	.000	.000	.000	.001	.013	.000	.000
NROTC	.994	.024	.129	.002	.066	.053	.073
AOC/OCS	.194	.405	.556	.435	.335	.323	.430
SURFACE	.259	.079	.060	.060	.303	.124	.073
SUBMARINE	.232	.004	.081	.003	.017	.004	.007
AIR	.065	.009	.040	.009	.040	.017	.004
USNA-SURFACE	.009	.200	.118	.271	.409	.255	.138
USNA-SUBMARINE	.044	.000	.001	.001	.013	.000	.000
USNA-AIR	.002	.031	.054	.064	.104	.092	.002
NROTC-SURFACE	.927	.084	.238	.007	.225	.113	.171
NROTC-SUBMARINE	.918	.887	.951	.698	.901	.733	.730
NROTC-AIR	.869	.035	.066	.032	.044	.046	.112
AOC-OCS-SURFACE	.835	.532	.371	.677	.619	.500	.460
AOC-OCS-SUBMARINE	.193	.829	.906	.756	.469	.702	.911
AOC-OCS-AIR	.194	.554	.765	.400	.722	.413	.373

Table F-9: SIGNIFICANCE LEVELS OF t-TESTS* STAYERS VS LEAVERS
 (* OF $H_0: \mu_S \leq \mu_L$ AGAINST $H_1: \mu_S > \mu_L$)
 1973 HOLDOUT GROUP
 (One Tail Tests)

the tests on the AFR variable. In MSR 74, although compressed range and reduced variability about the mean exist, the AFR variable is significant at the .02 level for SUBMARINERS.

An Analysis of Variance was performed on the data from MSR 73 and 74 groups for each of the following dependent variables--AFR, OCAT, the five OCA Factors and the individual OCA items selected for use in the predictor models--to test effects of the variables SOURCE, DESIGNATOR and STAY/LEAVE and their interactions. Representative results are shown in Tables F-10 and F-11. For example, the variables STAY/LEAVE and DESIGNATOR by STAY/LEAVE interaction have a significant effect in explaining AFR for the MSR 73 data. The effect of STAY/LEAVE is again significant in explaining AFR for the MSR 74 data. This correspondence is borne out in the tables of t-tests previously shown in that AFR was one of the more significant variables in most data subgroups.

In terms of the foregoing evidence derived from the results of the t-tests and the interactions in the ANOVA models, it is possible to reject the null hypotheses stated in Chapter III, viz: there is no difference between stayers and leavers in the perception of organizational climate and in job performance. The tests show clearly that there is a difference which is statistically significant. In the MSR 73 group which had more extensive tests because of model development, results obtained on the Experimental group were generally the same as those obtained subsequently on the Holdout group. Another fact that became apparent during the tests was that differences in the MSR 73 subgroups were not the same as the differences in the MSR 74 subgroups. The utility of these results are seen in the development of the predictor models described in the next section.

EFFECTDEPENDENT VARIABLES

	<u>AFR</u>	<u>OCAT</u>	<u>FACTOR 1</u>	<u>FACTOR 2</u>	<u>FACTOR 3</u>	<u>FACTOR 4</u>	<u>FACTOR 5</u>
SOURCE	.434	.647	.805	.281	.730	.674	.638
DESIGNATOR	.676	.019	.207	.004	.093	.016	.067
STAY-LEAVE	.027	.243	.187	.202	.660	.699	.093
SOURCE X DESIGNATOR	.899	.469	.739	.047	.922	.751	.309
SOURCE X STAY-LEAVE	.479	.446	.114	.679	.631	.527	.913
DESIGNATOR X STAY-LEAVE	.031	.254	.129	.834	.129	.198	.774
SOURCE X DESIGNATOR X STAY-LEAVE	.899	.194	.313	.179	.377	.212	.337

Table F-10: SIGNIFICANCE LEVELS CORRESPONDING TO THREE-WAY ANOVA'S
1973 GROUP

DEPENDENT VARIABLES

EFFECT

	<u>AFR</u>	<u>OCAT</u>	<u>FACTOR 1</u>	<u>FACTOR 2</u>	<u>FACTOR 3</u>	<u>FACTOR 4</u>	<u>FACTOR 5</u>
SOURCE	.4807	.5712	.1163	.9315	.9288	.0503	.8443
DESIGNATOR	.0606	.2084	.3034	.2239	.0441	.7433	.2996
STAY-LEAVE	.0582	.0286	.5160	.0073	.0417	.1548	.0031
SOURCE X DESIGNATOR	.2758	.1321	.0963	.4142	.0162	.7223	.1361
SOURCE X STAY-LEAVE	.9457	.6368	.2824	.6796	.3579	.4088	.8191
DESIGNATOR X STAY-LEAVE	.3151	.3996	.4607	.5884	.1566	.9810	.2511
SOURCE X DESIGNATOR X STAY-LEAVE	.5163	.4376	.2028	.6963	.3155	.6195	.5183

Table F-11: SIGNIFICANCE LEVELS CORRESPONDING TO THREE-WAY ANOVA'S
1974 GROUP

E. The Predictor Models

Statistically significant differences between STAYERS and LEAVERS as reflected in both AFR and OCA results were documented in the previous section. The development of predictor models exploiting these differences is described here.

Model development efforts were based on data from the MSR 73 Experimental group with functional testing slated for the MSR 73 Holdout group data. Several models were developed for each of four techniques. These techniques are:

- Automatic Interaction Detection
- Item Analysis
- Multiple Linear Regression Analysis
- Discriminant Function Analysis.

A brief description of these techniques follows:

AUTOMATIC INTERACTION DETECTION^{2/}

This analysis scheme asserts a specific statistical question, "Given the set of observations under consideration, what single predictor variable will give us a maximum improvement in our ability to predict values of the dependent variables?" This question, embedded in an interactive scheme is the basis for the algorithm used in this program. The program divides the sample, through a series of binary splits, into a mutually exclusive series of subgroups. Every observation is a member of exactly one of these subgroups. They are chosen so that at each step in the procedure, their means account for more of the total sum of squares (reduction of the predictive error) than the means of any other equal number of subgroups.

ITEM ANALYSIS^{3/}

For the form of Item Analysis implemented, the experimental group is randomly divided into two equal portions for the purpose of developing a scoring key. For each half of a sample group Pearson Product Moment correlations and their significance levels are computed between item responses and the criterion variable. Each analysis is inspected item by item. On the basis of the

significance levels, scores are assigned to the item responses. The two halves of the sample are used for cross validation and a combined key is constructed using the entire experimental group. On the basis of past performance of individuals with similar test scores a respondent is then classified as a stayer or leaver.

MULTIPLE LINEAR REGRESSION ANALYSIS^{4/}

Multiple Linear Regression Analysis consists of obtaining a best fitting, in the sense of the method of least squares, linear relationship between the dependent and explanatory variables. Distributional assumptions including normality are made to permit statistical inferences on forecasts. This procedure was implemented stepwise.

DISCRIMINANT FUNCTION ANALYSIS^{5/}

Discriminant Analysis is an optimal classification procedure closely related to regression analysis: except for the introduction of prior probabilities and alternative interpretations, the two are equivalent. This procedure was implemented stepwise. The computer runs showing development of the MSR 73 and MSR 74 models are available upon request.

For each of these techniques a model was developed which classifies a new observation (AFR and OCA results) as either a stayer or a leaver. The model which was judged as performing best according to a criterion of maximizing the probability that an individual declared to be a stayer is a true stayer, while maintaining a reasonable error rate in being correct when declaring leavers was that obtained by Discriminant Analysis.

The Discriminant Analysis model chosen was that obtained as the ninth step in a sequential procedure. In the case we considered, we sought a procedure for optimally classifying individuals into one of two groups. We assumed the observations were from one of two multivariate normal populations and that we

would make use of a discriminant function, or linear combination of the observations to serve as a boundary in the sample space between observed values to be classified as group 1 or group 2. Denoting the mean of the discriminant function as m_1 for group 1 and m_2 for group 2 and its variance as σ^2 for either group, the square of Mahalanobis distance^{6/} is defined as

$$D^2 = \frac{(m_1 - m_2)^2}{\sigma^2} \quad \text{which}$$

serves as a measure of the distance between the two populations. It is intuitively reasonable then to choose the discriminant function so as to maximize D^2 and choose a boundary constant to minimize the sum of the misclassification probabilities. This is achieved by setting the boundary value midway between the means, i.e., at

$$\frac{m_1 + m_2}{2} .$$

In general σ^2 will not be known but can be estimated and an asymptotically optimal procedure obtained. The model selected for the MSR 73 data is:

$$\begin{aligned} \text{DISCRIMINANT SCORE} = & .80 \times \text{AFR} + .24 \times \text{ITEM 6} - \\ & .29 \times \text{ITEM 7} + .34 \times \text{ITEM 16} + \\ & .55 \times \text{ITEM 19} - .67 \times \text{ITEM 25} + \\ & .32 \times \text{ITEM 37} - .80 \times [\text{NROTC-SURFACE}] - \\ & 1.45 \times [\text{AOC/OCA-SUBMARINE}] - 6.64. \end{aligned}$$

Where NROTC-Surface and AOC/OCS-Submarine are indicator variables equal to one if the individual is a member of the particular group or equal to zero if the individual is not in the particular group.

A similar procedure was used in the development and selection of the model for the MSR 74 group. The model chosen was obtained as the eighteenth step in a 24-step sequential procedure. The model selected is:

$$\begin{aligned} \text{DISCRIMINANT SCORE} = & .44 \times \text{AFR} - .17 \times \text{ITEM 04} - \\ & .33 \times \text{ITEM 07} + .19 \times \text{ITEM 09} + \\ & .22 \times \text{ITEM 17} + .18 \times \text{ITEM 18} + \\ & .22 \times \text{ITEM 20} - .16 \times \text{ITEM 21} + \\ & .18 \times \text{ITEM 25} + .14 \times \text{ITEM 27} + \\ & .17 \times \text{ITEM 28} - .17 \times \text{ITEM 32} - \\ & .13 \times \text{ITEM 33} + .20 \times \text{ITEM 39} + \\ & .95 \times [\text{USNA}] - 1.94 \times [\text{AOC-OCA}] + \\ & .89 \times [\text{NROTC-SUB}] - 2.02 \times [\text{AOC/OCS-SUB}] - 2.19. \end{aligned}$$

Where USNA, AOC/OCS, NROTC-Submarine, AOC/OCS-Submarine are indicator variables equal to one if the individual is a member of the particular group or equal to zero if the individual is not in the particular group.

The performance of the MSR 73 and MSR 74 models is shown in Tables F-13 and F-15 respectively. To summarize, the estimates of the model's performance versus chance are presented below in Tables F-12 and F-15. Using these tables one may obtain estimates of two types of conditional probabilities:

<u>MSR 73</u>	
<u>EVENT</u>	<u>ESTIMATED PROBABILITY</u>
A predicted stayer is a true stayer $P(S_T S_P)$.75*
A predicted leaver is a true leaver $P(L_T L_P)$.51*
A true stayer is a predicted stayer $P(S_P S_T)$.82
A true leaver is a predicted leaver $P(L_P L_T)$.41
* Computed using the proportion of stayers present in the total group. Using a ransom process based on only the total group proportion these would be .69 and .31 respectively.	

Table F-12: ESTIMATE OF PREDICTOR MODEL PERFORMANCE VERSUS CHANCE FOR MSR 73 DATA

DCRMFAC9				
STAYLEAV	COUNT	STAY		ROW TOTAL
	ROW PCT	LEAVE		
	COL PCT	1.00	2.00	
	TOT PCT			
STAY	1.00	151 87.0 75.1 56.8	21 12.2 32.3 7.9	172 64.7
LEAVE	2.00	50 53.2 24.9 18.8	44 46.8 67.7 16.5	94 35.3
	COLUMN TOTAL	201 75.6	65 24.4	266 100.0

EXPERIMENTAL

DCRMFAC9				
STAYLEAV	COUNT	STAY		ROW TOTAL
	ROW PCT	LEAVE		
	COL PCT	1.00	2.00	
	TOT PCT			
STAY	1.00	176 81.9 78.2 59.1	39 18.1 53.4 13.1	215 72.1
LEAVE	2.00	49 59.0 21.8 16.4	34 41.0 46.6 11.4	83 27.9
	COLUMN TOTAL	225 75.5	73 24.5	298 100.0

HOLDOUT

Table F-13: DECISION TABLES FOR EXPERIMENTAL AND HOLDOUT GROUPS--MSR 73

Note: The decision table is a cross tabulation of the predicted (by Discriminant Function Analysis) and observed stay/leave status for the sample groups. The column totals are the predicted numbers of stayers and leavers. The row totals are the observed numbers of stayers and leavers.

DCRMFACT				
COUNT	ROW PCT	COL PCT	TOT PCT	ROW TOTAL
STAY/LEAV	STAY	LEAVE	TOT PCT	ROW TOTAL
STAY	1.00	44.3	29	472
		93.9	6.1	77.6
		84.7	34.1	
		72.9	4.8	
LEAVE	2.00	80	56	136
		58.8	41.2	22.4
		15.3	65.9	
		13.2	9.2	
COLUMN TOTAL			85	608
			86.0	100.0

EXPERIMENTAL

DCRMFACT				
COUNT	ROW PCT	COL PCT	TOT PCT	ROW TOTAL
STAY/LEAV	STAY	LEAVE	TOT PCT	ROW TOTAL
STAY	1.00	45.8	35	493
		92.9	7.1	78.3
		87.7	32.4	
		72.7	5.6	
LEAVE	2.00	64	73	137
		46.7	53.3	21.7
		12.3	67.6	
		10.2	11.6	
COLUMN TOTAL			108	630
			82.9	100.0

HOLDOUT

Table F-14: DECISION TABLES FOR EXPERIMENTAL AND HOLDOUT GROUPS--MSR 74

probability of a true state given a predicted state and the probability of a predicted state given a true state. Probabilities of the first type may serve as measures of confidence in prediction while probabilities of the second type are measures of model performance.

<u>MSR 74</u>	
<u>EVENT</u>	<u>ESTIMATED PROBABILITY</u>
A predicted stayer is a true stayer $P(S_T S_P)$.85*
A predicted leaver is a true leaver $P(L_T L_P)$.65*
A true stayer is a predicted stayer $P(S_P S_T)$.93
A true leaver is a predicted leaver $P(L_P L_T)$.53

* Computer using the proportion of stayers present in the total group. Using a random process based on only the total group proportion these would be .78 and .22 respectively.

Table F-15: ESTIMATE OF PREDICTOR MODEL PERFORMANCE VERSUS CHANCE FOR MSR 74 DATA

It should be noted that the improvement over chance indicated by the model performance actually understates the case. As stated, the probabilities derived were based on the known proportion of stayers and leavers in the group. This information resulted from familiarity with the data derived from a specified experimental design for this study. The improved prediction capability based on performance of the model with respect to pure chance, e.g., the flip of a coin to determine a STAYER/LEAVER, would be in the case of MSR 73: $.75-.50=.25$ or a 25 percent improvement over chance with the use of the model. Similarly, for MSR 74 the improvement would be 35 percent $(.85-.50=.35)$. The derived prediction probabilities for stayers involve a trade-off with the prediction of leavers. We can predict stayers at the 100 percent level by classifying all

eligibles as stayers. At the same time, we misclassify 100 percent of the leavers. The probabilities selected for stayer prediction maintain a "reasonable" error rate in classifying leavers.

Since the individual's true STAY-LEAVE status is also known it is possible to tell whether or not a misclassification has taken place. Estimates of the probability of each of the two types of misclassification were obtained and have been presented and discussed above.

The resulting models may now be used as tools for classification of a new individual as either a STAYER or a LEAVER. If the discriminant function, evaluated at the individual's response set, is positive then he is classified as a LEAVER, if negative, as a STAYER. Assessments of the accuracy of prediction can be made in subsequent quarters when resignations become official.

Another measure of the extent of the classification powers of the model is the correlation between the classifications indicated by the model and the true classifications.

While the natural dichotomy cannot be ignored, the Pearson Product Moment Correlation may be used for this purpose. Codes of 1 and 2 were assigned to the classes STAY and LEAVE respectively and the Pearson correlations were computed for each of the 1973 and 1974 Experimental and Holdout Groups.*

These correlations (r) and their squares (r^2) are presented in Table F-16. The correlations are all positive indicating the general trend to classify each group correctly. They are all significant at the .001 level indicating that there is indeed a non-zero correlation and some linear relationships between the true and declared classifications.

* The specific choice of values has no effect on the correlation computed other than that the ordering determines the sign.

<u>1973</u>				<u>1974</u>			
<u>Experimental</u>		<u>Holdout</u>		<u>Experimental</u>		<u>Holdout</u>	
r	r ²	r	r ²	r	r ²	r	r ²
.38	.15	.24	.05	.51	.26	.42	.18

Table F-16: PEARSON PRODUCT MOMENT CORRELATIONS
BETWEEN OBSERVED AND DECLARED STAY-
LEAVE CLASSIFICATIONS

It should be noted that each Experimental Correlation is higher than the corresponding Holdout Correlation. This was to be expected since the models were developed specifically to fit the Experimental groups. The value of r^2 may be thought of as the proportion of variation between the observed and declared classifications which is explained by the model. Thus, for the 1973 Holdout group, 5 percent of the variation is explained by the model and for the 1974 Holdout group 18 percent of the variation is thus explained.

The difference between the 1973 and 1974 results may be due, at least in part, to the relatively high proportion of STAYERS in the "younger" 1974 group and the placement of emphasis in the model selection.

F. Stability of the OCA

The OCA was tested for stability during this phase of the investigation by using the Test-Retest method. A full description of the method, administration and calculation of results appeared in the original report. Since the sample size was small (N=23) a Spearman coefficient of correlation was calculated as a measure of the stability of the survey instrument. This was found to be .65, which is considered satisfactory in view of these facts:

1. The instrument tested is an inventory not a test.
2. It was self-administered.
3. The conditions of administration were uncontrolled.
4. The time interval between completion of the surveys was approximately three to four months.

5. The surround or environment of the Navy, particularly in the operating forces, is highly dynamic.
6. The lapse of time provided ample time for real change in the organization.

In the context outlined above, we believe that the evidence is sufficient to claim stability for the OCA.

Footnotes

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